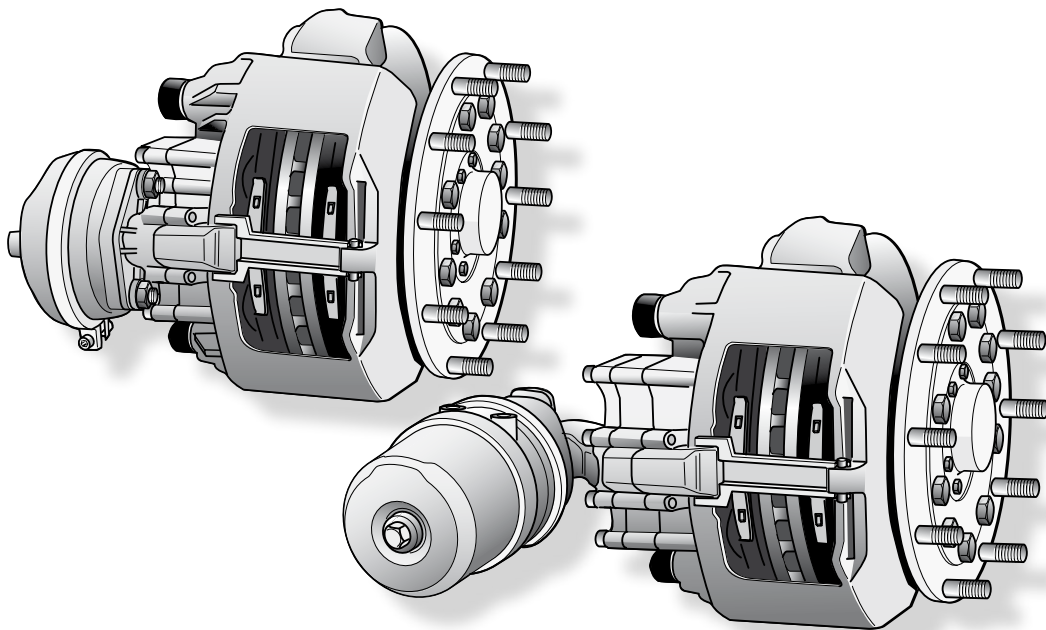


Service Manual

# Air Disc Brake

## SB6 - SB7 - Axial and Radial Disc Brake



**KNORR-BREMSE**



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## PLEASE NOTE

This Service manual is intended for the exclusive use of trained persons within the commercial vehicle industry and workshops, and must not be passed to any third party.

This service manual has been prepared to assist customers to carry out their own service work on the product and does not purport to be all-inclusive or to contain all of the information necessary for this. No responsibility is assumed as a result of this or as a result of incorrect or inappropriate parts being fitted to the product.

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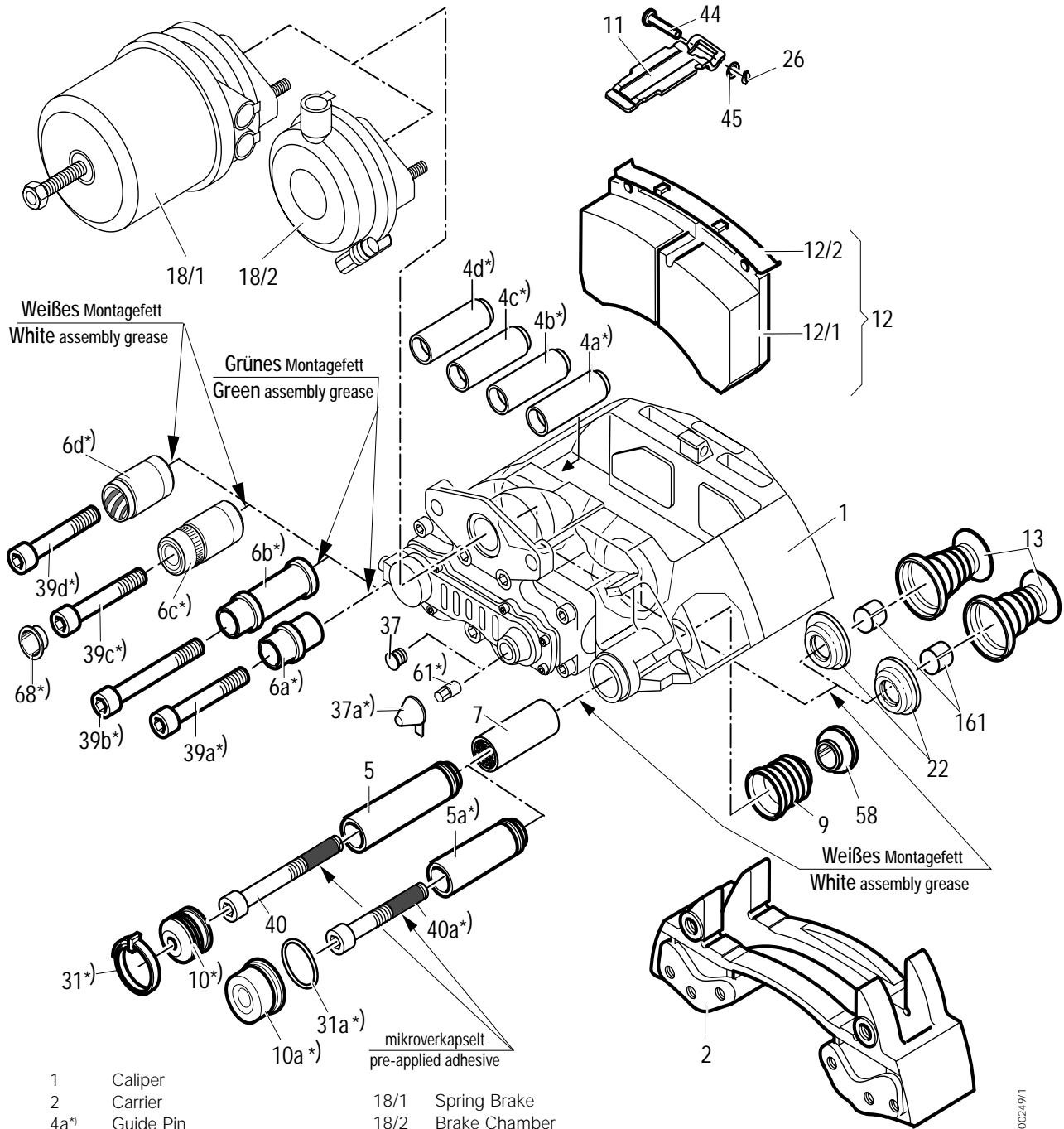
Failure of any individual clause of this disclaimer to comply with current legal provisions does not affect the validity of the remaining clauses.

This disclaimer is an English translation of a German text, which should be referred to for all legal purposes.

# 1 Overview

## 1.1 Axial Disc Brake Components

(for Wear Indicators see Section 1.2.1)



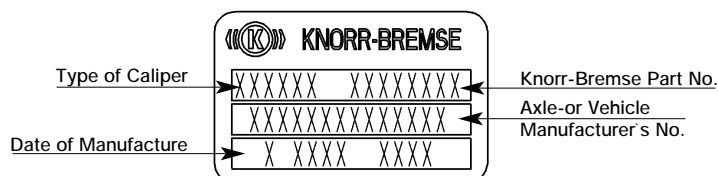
1	Caliper	18/1	Spring Brake
2	Carrier	18/2	Brake Chamber
4a*)	Guide Pin	22	Inner Seal
4b*)	Guide Pin	26	Spring Clip
4c*)	Guide Pin	31	Outer Boot Clip
4d*)	Guide Pin	31a*)	O-Ring
5	Guide Pin	37	Adjuster Cap
5a*)	Guide Pin	37a*)	Adjuster Cap
6a*)	Rubber Bush	39a*)	Caliper Bolt
6b*)	Rubber Bush	39b*)	Caliper Bolt
6c*)	Rubber Bush	39c*)	Caliper Bolt
6d*)	Rubber Bush	39d*)	Caliper Bolt
7	Brass Bush	40	Caliper Bolt
9	Inner Boot	40a*)	Caliper Bolt
10	Outer Boot	44	Pad Retainer Pin
10a*)	Steel Cap	45	Washer
11	Pad Retainer (reinforced)	58	Ring
12	Pad (complete)	61*)	Shear Adapter
12/1	Pad	68*)	Cap
12/2	Pad Holder Spring	161	Tappet Bush
13	Tappet and Boot Assembly		

+) Variants

See also contents leaflet in the Service Kit

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## 1.2 Axial Disc Brake Identification and Service Kits



### ATTENTION!

*Use only genuine Knorr-Bremse parts!*

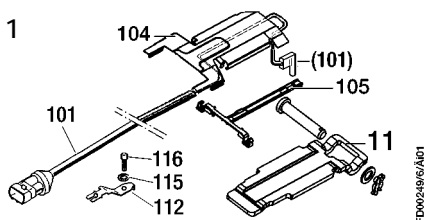
The following Service Kits are available :

Description	Contents	
Carrier	2	
Guide Pins and Seal Kit	4a <sup>*)</sup> , 5, 6a <sup>*)</sup> , 7, 9, 10 <sup>*)</sup> , 31 <sup>*)</sup> , 39a <sup>*)</sup> , 40, 58, (4b <sup>*)</sup> , 4c <sup>*)</sup> , 4d <sup>*)</sup> , 5a <sup>*)</sup> , 6b <sup>*)</sup> , 6c <sup>*)</sup> , 6d <sup>*)</sup> , 10a <sup>*)</sup> , 31a <sup>*)</sup> , 39b <sup>*)</sup> , 39c <sup>*)</sup> , 39d <sup>*)</sup> , 40a <sup>*)</sup> , 68 <sup>*)</sup> )	For specific Service Kit Part Numbers for each Disc Brake, see Disc Brake Product Catalogue (Part Number Y000875) or <a href="http://www.knorr-bremsesfn.com">www.knorr-bremsesfn.com</a>
Set for Rubber Bush	4a <sup>*)</sup> , 6a <sup>*)</sup> , 39a <sup>*)</sup> , (4b <sup>*)</sup> , 6b <sup>*)</sup> , 39b <sup>*)</sup> )	
Tappet and Boot Kit (2 pieces)	13, 22, 161	
Set for Outer Boot and Steelcap (6 pieces)	10, 31, 10a <sup>*)</sup> , 31a <sup>*)</sup>	
Adjuster Cap (10 pieces)	37, 37a <sup>*)</sup> , 61 <sup>*)</sup>	
Pad Kit (per axle)	11, 12, 26, 37, 37a <sup>*)</sup> , 44, 45, 61 <sup>*)</sup>	
Wear Indicator Kit (per axle)	see section 1.2.1	
Exchange Caliper r.h.	only in assembled condition	see Identification Plate on the Caliper
Exchange Caliper l.h.		

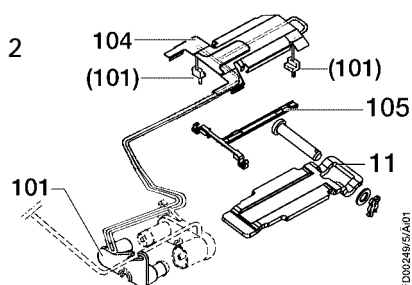
### 1.2.1 Axial Disc Brake Wear Indicator Kits

<sup>\*)</sup> Variants

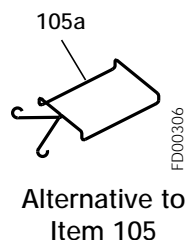
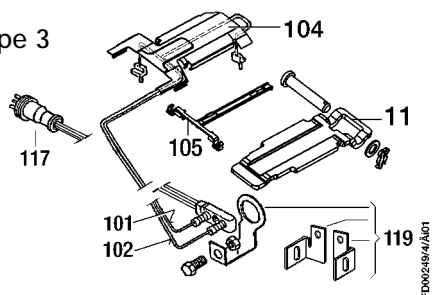
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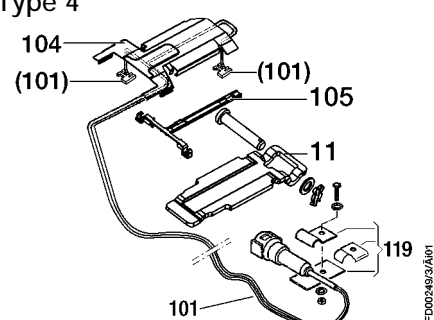
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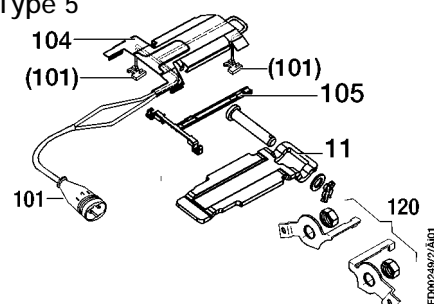
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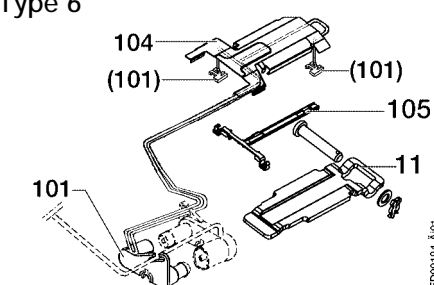
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Type 5

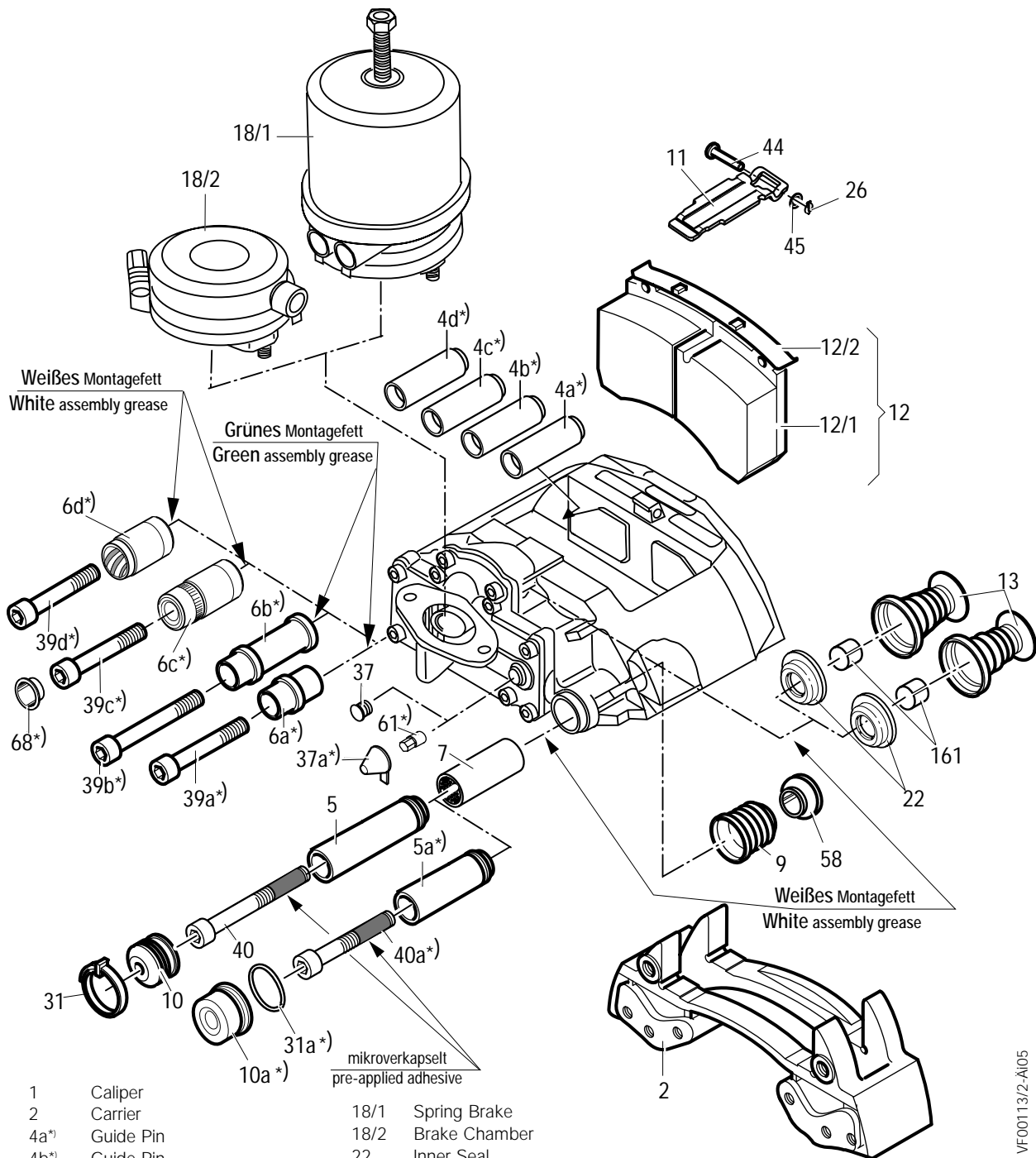


Type 6



- |                            |                          |
|----------------------------|--------------------------|
| 101 Sensor                 | 115 Spring Washer        |
| 102 Sensor                 | 116 Screw                |
| 104 Cable Protection Plate | 117 Wear Indicator Cable |
| 105 Cable Guide            | 119 Bracket              |
| 105a Cable Guide           | 120 Bracket              |
| 112 Clip                   |                          |

### 1.3 Radial Disc Brake Components (for Wear Indicators see 1.4.1)



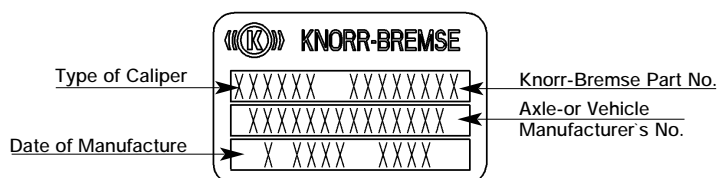
1	Caliper	18/1	Spring Brake
2	Carrier	18/2	Brake Chamber
4a*)	Guide Pin	22	Inner Seal
4b*)	Guide Pin	26	Spring Clip
4c*)	Guide Pin	31	Outer Boot Clip
4d*)	Guide Pin	31a*)	O-Ring
5	Guide Pin	37	Adjuster Cap
5a*)	Guide Pin	37a*)	Adjuster Cap
6a*)	Rubber Bush	39a*)	Caliper Bolt
6b*)	Rubber Bush	39b*)	Caliper Bolt
6c*)	Rubber Bush	39c*)	Caliper Bolt
6d*)	Rubber Bush	39d*)	Caliper Bolt
7	Brass Bush	40	Caliper Bolt
9	Inner Boot	40a*)	Caliper Bolt
10	Outer Boot	44	Pad Retainer Pin
10a*)	Steel Cap	45	Washer
11	Pad Retainer (reinforced)	58	Ring
12	Pad (complete)	61*)	Shear Adapter
12/1	Pad	68*)	Cap
12/2	Pad Holder Spring	161	Tappet Bush
13	Tappet and Boot Assembly		

\*) Variants

See also contents leaflet in the Service Kit

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## 1.4 Radial Disc Brake Identification and Service Kits



### ATTENTION!

*Use only genuine Knorr-Bremse parts!*

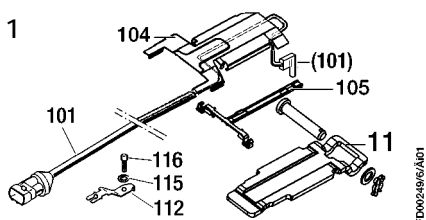
The following Service Kits are available :

Description	Contents	
Carrier	2	For specific Service Kit Part Numbers for each Disc Brake, see Disc Brake Product Catalogue (Part Number Y000875) or <a href="http://www.knorr-bremsesfn.com">www.knorr-bremsesfn.com</a>
Guide Pins and Seal Kit	4a <sup>*)</sup> , 5, 6a <sup>*)</sup> , 7, 9, 10 <sup>*)</sup> , 31 <sup>*)</sup> , 39a <sup>*)</sup> , 40, 58, (4b <sup>*)</sup> , 4c <sup>*)</sup> , 4d <sup>*)</sup> , 5a <sup>*)</sup> , 6b <sup>*)</sup> , 6c <sup>*)</sup> , 6d <sup>*)</sup> , 10a <sup>*)</sup> , 31a <sup>*)</sup> , 39b <sup>*)</sup> , 39c <sup>*)</sup> , 39d <sup>*)</sup> , 40a <sup>*)</sup> , 68 <sup>*)</sup> )	
Set for Rubber Bush	4a <sup>*)</sup> , 6a <sup>*)</sup> , 39a <sup>*)</sup> , (4b <sup>*)</sup> , 6b <sup>*)</sup> , 39b <sup>*)</sup> )	
Tappet and Boot Kit (2 pieces)	13, 22, 161	
Set for Outer Boot and Steelcap (6 pieces)	10, 31, 10a <sup>*)</sup> , 31a <sup>*)</sup>	
Adjuster Cap (10 pieces)	37, 37a <sup>*)</sup> , 61 <sup>*)</sup>	
Pad Kit (per axle)	11, 12, 26, 37, 37a <sup>*)</sup> , 44, 45, 61 <sup>*)</sup>	
Wear Indicator Kit (per axle)	see section 1.2.1	
Exchange Caliper r.h.	only in assembled condition	see Identification Plate on the Caliper
Exchange Caliper l.h.		

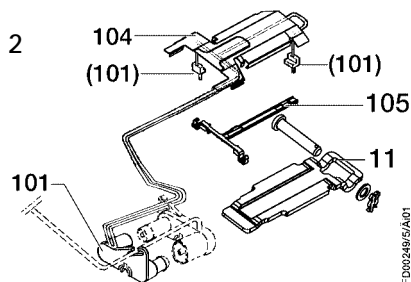
### 1.4.1 Radial Disc Brake Wear Indicator Kits

<sup>\*)</sup> Variants

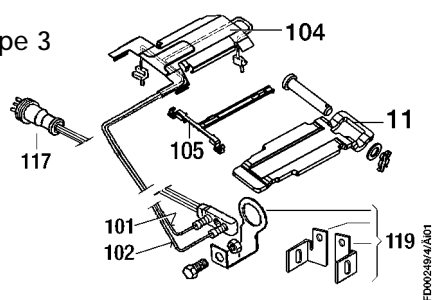
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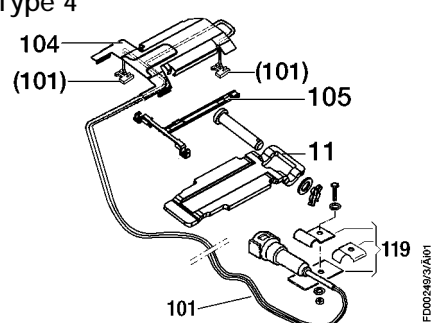
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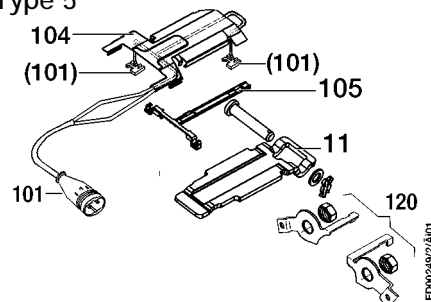
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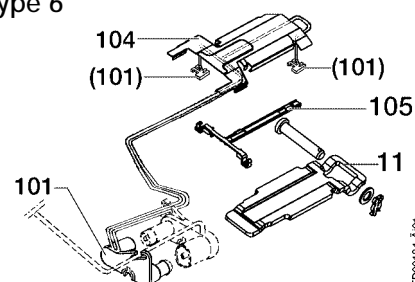
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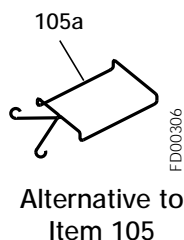
Type 5



Type 6



- |                            |                          |
|----------------------------|--------------------------|
| 101 Sensor                 | 115 Spring Washer        |
| 102 Sensor                 | 116 Screw                |
| 104 Cable Protection Plate | 117 Wear Indicator Cable |
| 105 Cable Guide            | 119 Bracket              |
| 105a Cable Guide           | 120 Bracket              |
| 112 Clip                   |                          |



## **1.5 Brake Disc**

(for Axial and Radial Disc Brakes)

When replacing the Discs, please refer to the instructions of the Vehicle Manufacturer.

This should also be done when fitting Knorr-Bremse Brake Discs.

When replacing Discs, please adhere to the recommended bolt tightening torques.

The use of non-approved Brake Discs will reduce levels of safety and invalidate warranty.

Brake Discs can be ordered through the Knorr-Bremse Aftermarket Organisation.

Detailed information can be found in our Disc Brake Product Catalogue (Part Number Y000875) or at [www.knorr-bremsesfn.com](http://www.knorr-bremsesfn.com).



## 2 General Information (for Axial and Radial Disc Brakes)

### 2.1 Service Tools

Part Number	Description
II19252	Press-in Tool for Tappet and Boot Assembly (13)
II19253	Pull-in Tool for Inner Boot (9)
II19254	Pull-in/Pull-out Tool for Brass Bush (7)
II32202	Wedged Fork for removal of Tappet and Boot Assembly (13)
II36797	Grooving Tool for Brass Bush (7)
Z001105	Press-in Tool for Steel Cap (10a)
Z004198	Pull-in/Pull-out Tool for Rubber Bush (6c) and (6d)
Z003934	Press-in Tool for Cap (68)
Z004361	Press-in Tool for Inner Seal (22)

*Service tool kit ZB9032 (Part No. II37951004EN) contains the above listed tools for items 7, 9, 10a, and 13 as well as this Service manual and a service video. The service video in English is available separately in the UK as Part No. KBP2060/1 and in other territories as B98283EN.*

*The tools for items 6c, 6d, 22 and 68 are not part of the Service Tool Kit ZB9032 (Part No. II37951004EN)*

### 2.2 Diagnostic Equipment

Part Number	Description
II40598F	<b>ZB9031-2</b> hand held device for checking Potentiometer function (also Pad plus Disc wear) when 13 pin chassis plug installed. <b>ZB9031-2</b> replaces <b>ZB9031</b>

### 2.3 Lubrication

Part Number	Colour	Quantity
II14525	white	5g
II32793	green	8g
II32868	white	500g
Z000046	green	500g

**Important Note:** The correct grease **MUST** be used for each Bush !

### 2.4 Torque Requirements

Item Number		Torque	Spanner Size (mm)
39a; 39b; 39c; 39d; 40; 40a;	Caliper Bolts (x2) M16x1,5 - 10.9	180 Nm plus 90°	14
	Brake Chamber, Spring Brake Hexagon Nuts M16x1,5 (x2) (self-locking) EN ISO 10531	180 <sup>+30</sup> Nm	24

### 3.1 Axial Disc Brake Sectioned View



10

## **3.2 Description of Operation**

(Floating Caliper principle)

### **3.2.1 Brake Actuation**

During actuation, the Push Rod of the Actuator (18/1 or 18/2) moves the Lever (19). The input forces are transferred via the Eccentric Bearing (20) to the Bridge (17). The force is then distributed by the Bridge (17) and the two Threaded Tubes (16) to the Tappet and Boot Assemblies (13) and finally to the inboard Pad (12).

After overcoming the running clearance between the Pads and the Disc, the reaction forces are transmitted to the outboard Pad (12). The clamping forces on the Pads (12) and the Disc (46) generate the braking force for the wheel.

### **3.2.2. Brake Release**

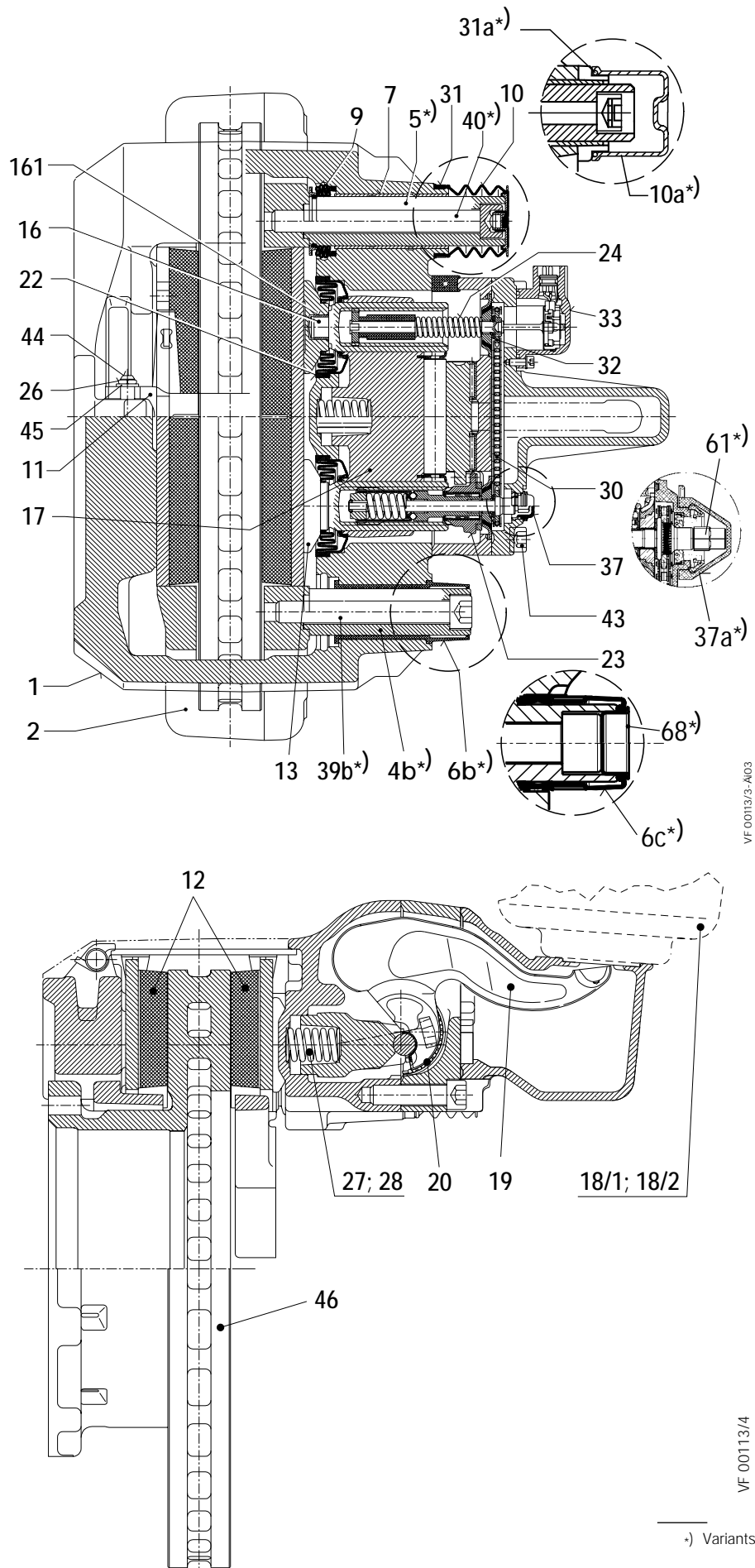
After releasing the air pressure, the two Return Springs (27/28) push the Bridge (17) and Lever (19) back to the start position; this ensures a running clearance between Pads and Disc is maintained.

### **3.2.3 Brake Adjustment (automatic)**

To ensure a constant running clearance between Disc and Pads, the brake is equipped with a low wearing, automatic adjuster mechanism. The Adjuster (23) operates with every cycle of actuation due to the mechanical connection with Lever (19). As the Pads and Disc wear, the running clearance increases. The Adjuster (23) and Turning Device (24) turn the Threaded Tubes (16) by an amount necessary to compensate for this wear. The total running clearance (sum of clearance both sides of Disc) should be between 0.5 and 1.0 mm.; smaller clearances may lead to overheating problems.

### 3.3 Radial Disc Brake Sectioned View

- 1 Caliper
- 2 Carrier
- 4b\*) Guide Pin
- 5\*) Guide Pin
- 6b\*) Rubber Bush
- 6c\*) Rubber Bush
- 7 Brass Bush
- 9 Inner Boot
- 10\*) Outer Boot
- 10a\*) Steel Cap
- 11 Pad Retainer (reinforced)
- 12 Pad (complete)
- 13 Tappet and Boot Assembly
- 16 Threaded Tube
- 17 Bridge
- 18/1 Spring Brake
- 18/2 Brake Chamber
- 19 Lever
- 20 Eccentric Bearing
- 22 Inner Seal
- 23 Adjuster Unit
- 24 Turning Device
- 26 Spring Clip
- 27 Spring
- 28 Spring
- 30 Chain
- 31 Outer Boot Clip
- 31a\*) O-Ring
- 32 Chain Wheel
- 33 Wear Sensor
- 37 Adjuster Cap
- 37a\*) Adjuster Cap
- 39b\*) Caliper Bolt
- 40\*) Caliper Bolt
- 43 Bolt
- 44 Pad Retainer Pin
- 45 Washer
- 46 Disc
- 61\*) Shear Adapter
- 68\*) Cap
- 161 Tappet Bush



VF 00113/3-A03

VF 00113/4

→ Variants

### **3.4 Description of Operation**

(Floating Caliper principle)

#### **3.4.1. Brake Actuation**

During actuation, the Push Rod of the Actuator (18/1 or 18/2) moves the Lever (19). The input forces are transferred via the Eccentric Bearing (20) to the Bridge (17). The force is then distributed by the Bridge (17) and the two Threaded Tubes (16) to the Tappet and Boot Assemblies (13) and finally to the inboard Pad (12).

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#### **3.4.2. Brake Release**

After releasing the air pressure, the two Return Springs (27/28) push the Bridge (17) and Lever (19) back to the start position; this ensures a running clearance between Pads and Disc is maintained.

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To ensure a constant running clearance between Disc and Pads, the brake is equipped with a low wearing, automatic adjuster mechanism. The Adjuster (23) operates with every cycle of actuation due to the mechanical connection with Lever (19). As the Pads and Disc wear, the running clearance increases. The Adjuster (23) and Turning Device (24) turn the Threaded Tubes (16) by an amount necessary to compensate for this wear. The total running clearance (sum of clearance both sides of Disc) should be between 0.5 and 1.0 mm.; smaller clearances may lead to overheating problems.

## 4 Inspection Points for the Axial and Radial Disc Brake

Despite the use of long-life materials, it is necessary to check some of the components regularly for their general condition. The following points ensure a long-life and trouble-free operation of the disc brake. The inspection frequencies specified are minimum values. Depending on the vehicle application a more frequent check of the components may be necessary.

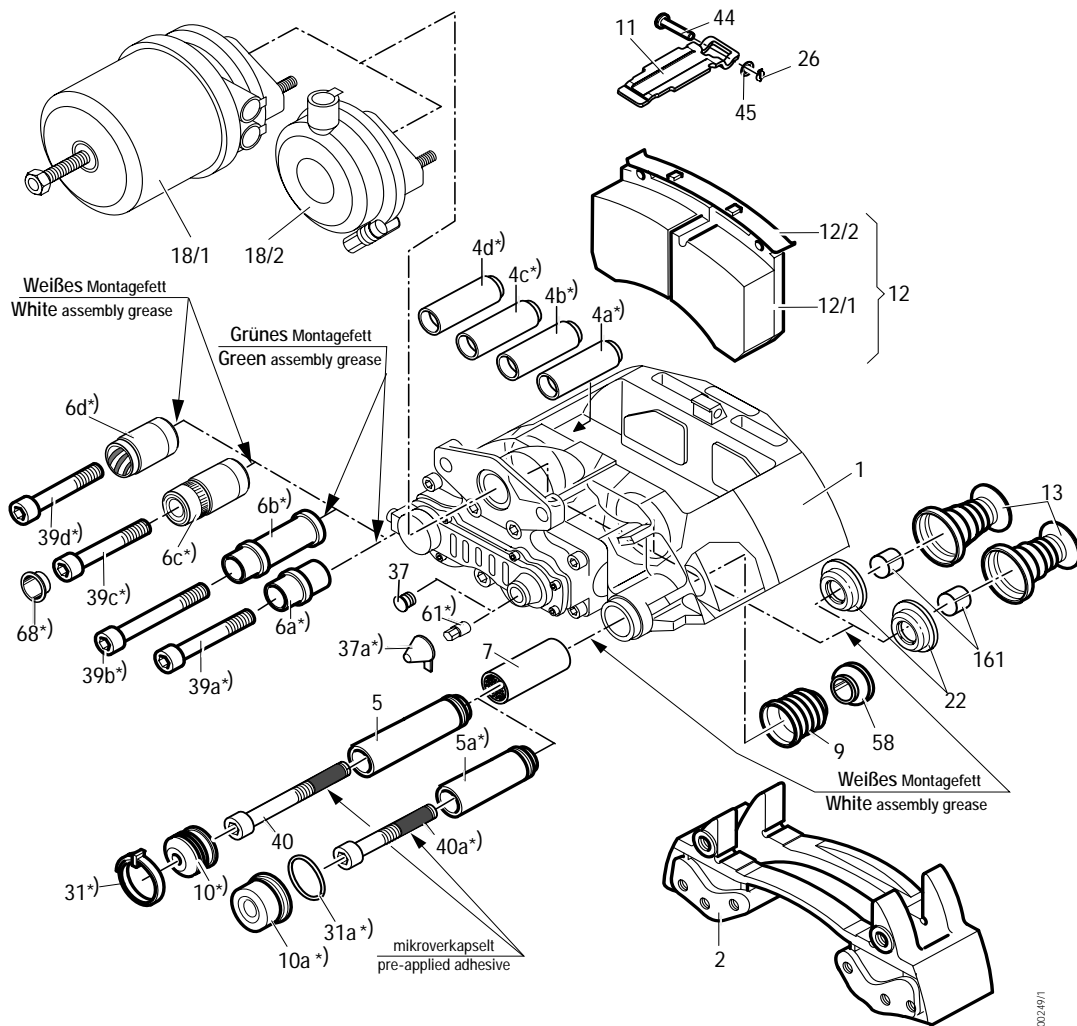
The brake pad wear must be checked visually on a regular basis, e.g. each time the tyre pressures are checked, or at least every three months (see Sections 5.1.1, 5.1.2, 5.1.3).

At least annually inspect the pad to disc running clearance and the correct fitting and condition of the Outer Boot (10) or Steel Cap (10a) and the Adjuster Cap (37 or 37a) (see Section 5.3.1).

With each Pad change check for the correct functioning of the Adjuster (see Section 5.2) and the smooth operation of the caliper over its full range of movement (see Section 5.3.2). Also inspect the Tappet and Boot Assemblies (13), the Adjuster Cap (37 or 37a) and the sealing elements (6c, 9, 10, 10a, 31, 58, 68) for correct fitting and condition.

The brake discs are to be checked according to the specification of the axle or vehicle manufacturer.

In the unlikely event of a problem, all relevant components - e.g. Pads (12/1) and Pad Holder Springs (12/2) - must be returned in order that an objective investigation of the cause can be made.



FD00249/1

#### 4.1 Safety Instructions for Service Work and Repair Work

(for Axial and Radial Disc Brakes)

Please also refer to the relevant safety instructions for repair work on commercial vehicles, especially for jacking up and securing the vehicle.

Use only original Knorr-Bremse parts.

##### ***ATTENTION!***

*Before starting service work, ensure the service brake and parking brake, as well as the bus stop brake with buses, are not applied and that the vehicle cannot roll away.*

Please follow service manual instructions and adhere to the wear limits of the Pads and the Discs - see Section 5.1.

Use only recommended tools - see Section 2.1.

Tighten bolts and nuts to the recommended torque values - see Section 2.4.

##### ***ATTENTION!***

*Screw threads and tapped holes must be clean and dry (free of lubrication).*

After re-fitting a wheel according to the Vehicle Manufacturer's recommendations, please ensure that there is sufficient clearance between the tyre inflation valve, the caliper and the wheel rim, to avoid damage to the valve.

After service work:  
Check the brake performance and the system behaviour on a rolling road.

## 5 Functional and Visual Check

(for Axial and Radial Disc Brakes)

### 5.1 Wear Check of Pads and Brake Discs

#### **ATTENTION!**

*For optimum safety, stay within the Disc and Pad Wear Limits.*

#### **Pads**

The thickness of the Pads must be checked regularly dependent on the usage of the vehicle.

The Pads should be checked corresponding to any legal requirements that may apply.

If a Wear Indicator has not been fitted or is not connected, this should be at least every 3 months.

If friction material is less than 2mm (see E, Sketch 3), the Pads must be replaced.

Minor damage at the edges is permitted (see arrow, Sketch 1).

Major damage on the surface of the Pad is not permitted (see arrow, Sketch 2).

#### **Discs**

Measure thickness at thinnest point. Avoid measuring near the edge of the disc as a burr may be present.

A = Disc thickness

new condition = 45 mm

worn condition = 37 mm (**must** be replaced)

C = Overall thickness of Pad (new condition) 30mm

D = Backplate 9mm

E = Minimum thickness of friction material 2mm

F = Minimum allowed thickness in worn condition for backplate and friction material 11mm (replacement of Pads necessary).

If the disc dimension  $A \leq 39$  mm, it is recommended that the Disc should be renewed together with the Pads.

Sketch 1



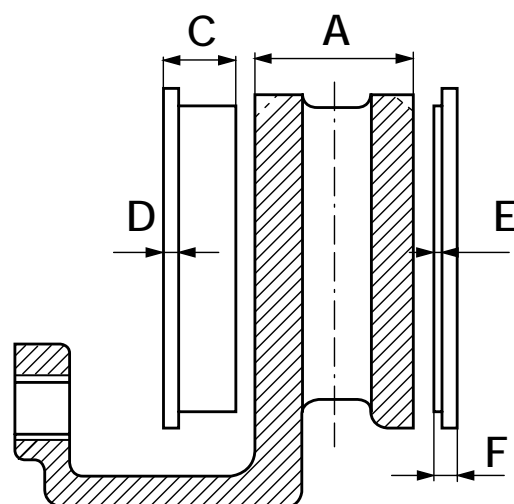
FD00203

Sketch 2



FD00204

Sketch 3



M+P-KN-002&101

#### **ATTENTION!**

*If these recommendations are ignored, there is a danger of brake failure.*



Check Disc at each change of Pads for grooves and cracks.

The diagram shows possible surface conditions.

**A<sub>1</sub>** = Small cracks spread over the surface  
**are allowed**

**B<sub>1</sub>** = Cracks less than 1.5mm deep or wide, running  
in a Radial direction **are allowed**

**C<sub>1</sub>** = Grooves (circumferential) less than 1.5mm  
deep **are allowed**

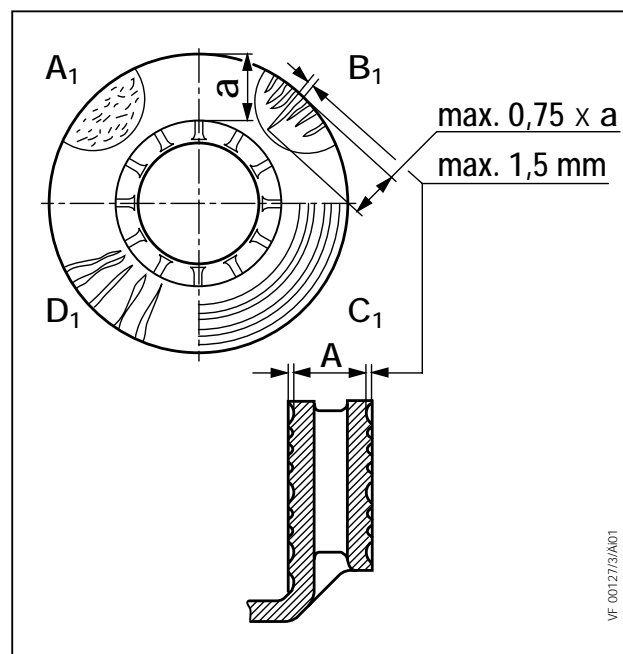
**D<sub>1</sub>** = Cracks in the vanes **are not allowed** and the  
Disc **MUST BE REPLACED**.

**a** = Pad contact area

**Note:**

In case of surface conditions A<sub>1</sub>, B<sub>1</sub> and C<sub>1</sub>, the Disc  
can continue to be used until the minimum  
thickness A of 37mm is reached.

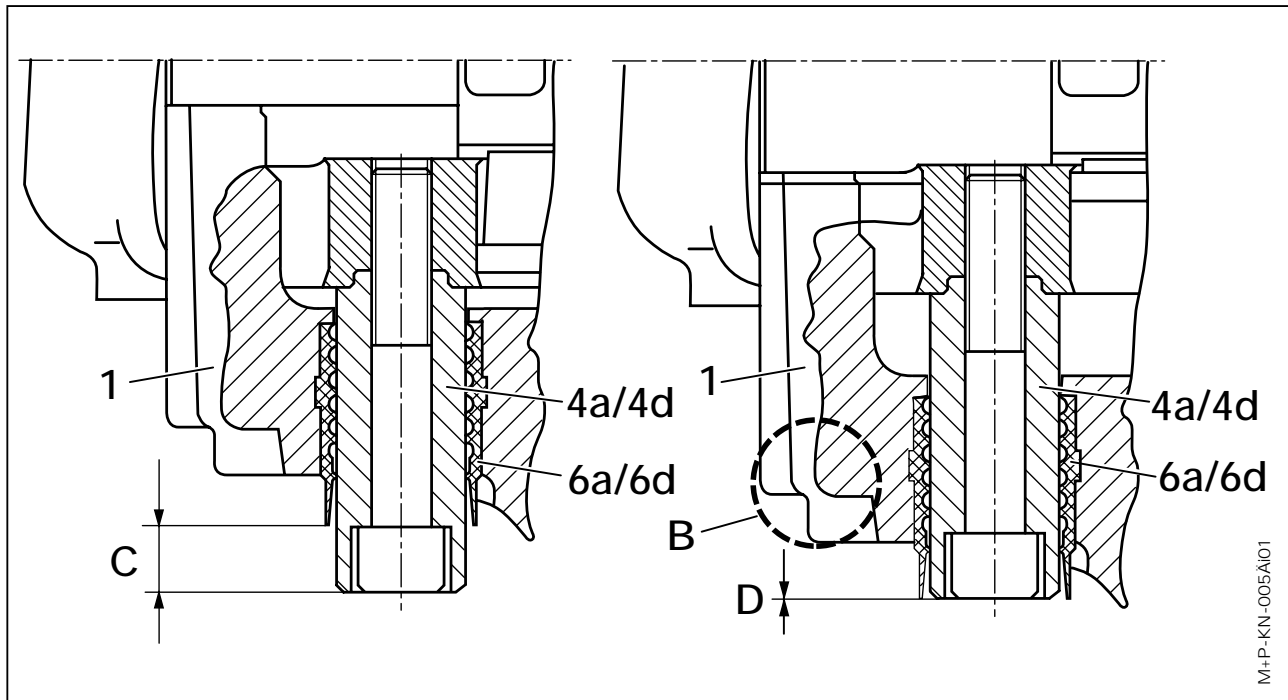
Knorr-Bremse Discs are normally service-free and  
grinding when changing Pads is not necessary.  
However, grinding could be useful, e.g. to increase  
the load-bearing surface of the Pads after severe  
grooving on the entire friction surface has occurred.  
To meet safety requirements, the minimum thickness  
after regrounding must be greater than 39 mm.  
In addition, the recommendations of the Vehicle  
Manufacturer **MUST** be followed.



**ATTENTION!**

*If these recommendations are ignored, there is a danger of brake failure. If the Pads are worn down to the backplate or if Disc wear is excessive, brake performance will be severely affected and may be lost completely.*

**5.1.1 Brake Wear Check using Rubber Bush (6a; 6d):** For all Axial and Radial Disc Brakes except those listed in **Section 5.1.2** and **5.1.3**. These Calipers do **not** have a cast rib in position B (see also Section 5.1.2)



The condition of the Pads can be visually determined without removing the road wheel by viewing the position of the Guide Pin (4a or 4d) in the Caliper (1).

If dimension 'C' is less than 1mm, a more accurate check of the Pads and Disc must be made.

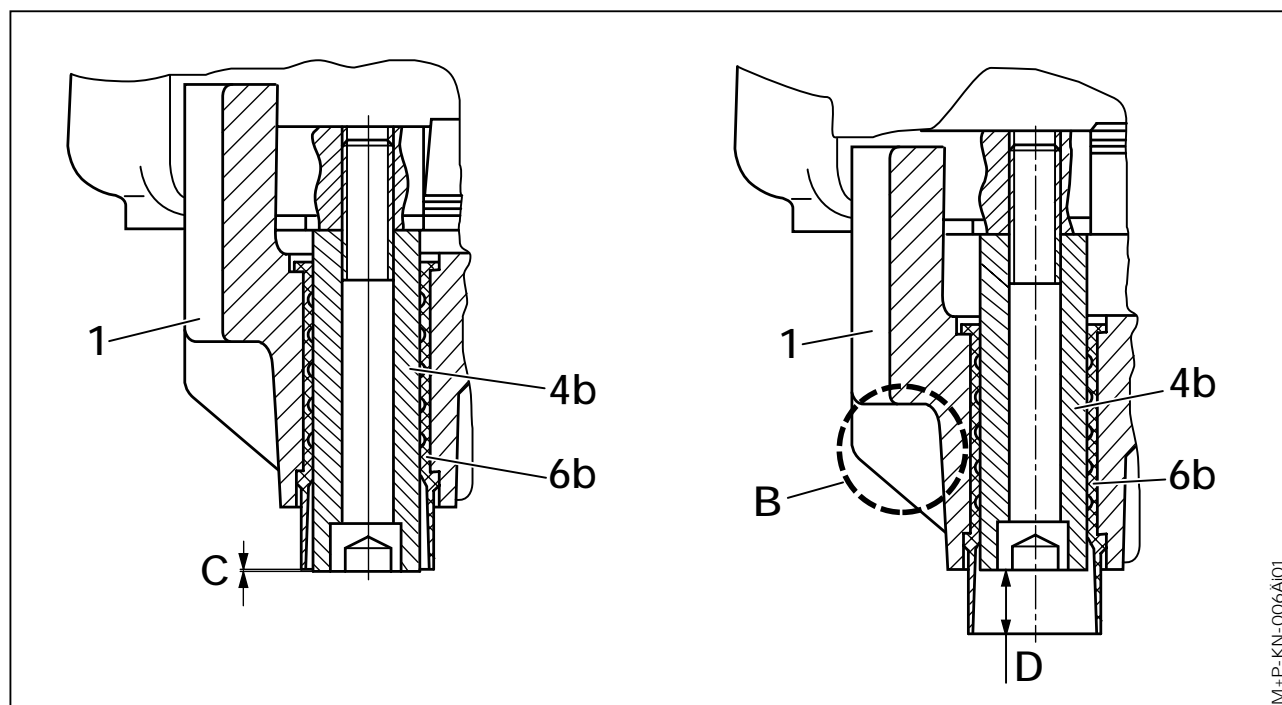
If necessary change the Pads - see Section 6, or the Disc - see Vehicle Manufacturer's recommendations.

B = without rib (see also Section 5.1.2)

C = pin protrusion - shown in new condition

D = 1 mm or less - Pads and Disc must be checked with road wheel removed

**5.1.2 Brake Wear Check using Rubber Bush (6b):** Only for Axial Disc Brakes **SB 7541, SB 7551 to SB 7629, SB 7639** and Radial Disc Brakes **SB 7102, SB 7112, SB 7103, SB 7113, SB 7104, SB 7114, SB 7105, SB 7115, SB 7108, SB7118, SB 7109, SB 7119, SB 7120, SB 7130.**  
 These Calipers **do** have a cast rib in position B (see also Section 5.1.1)



The condition of the Pads can be visually determined without removing the road wheel by viewing the position of the Guide Pin (4b) in the Caliper (1).

If the head of the Guide Pin (4b) is inside the Rubber Bush (6b) by a dimension D greater than 18mm, then a more accurate check of the Pads and Disc must be made.

If necessary change the Pads - see Section 6, or the Disc - see Vehicle Manufacturer's recommendations.

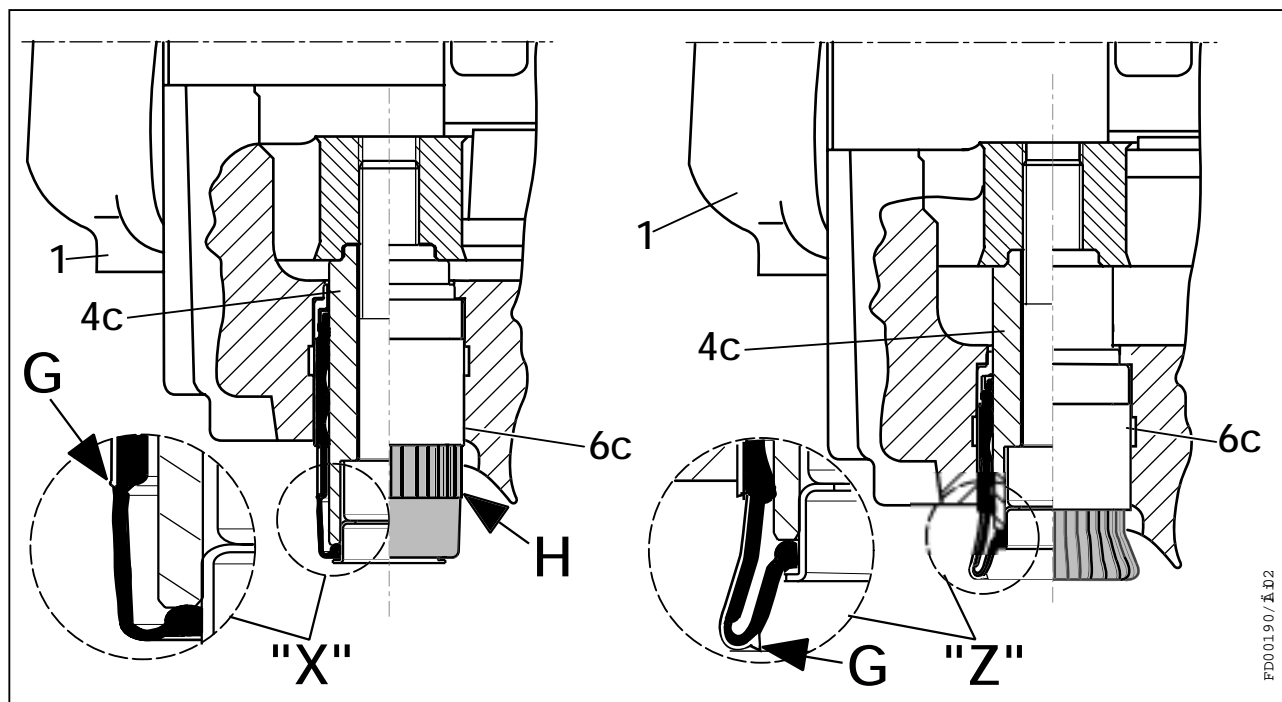
B = with rib (see also Section 5.1.1)

C = new condition

D = 18 mm or more, Pads and Disc must be checked with road wheel removed

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**5.1.3 Brake Wear Check using Rubber Bush (6c, axially ribbed):** For all Axial and Radial Disc Brakes which are equipped with a Rubber Bush that is axially ribbed (see H in sketch).



The condition of the Pads can be visually determined without removing the road wheel, by viewing the position of the Wear Indicator "G".

### **New Condition** (see "X")

The position of Wear Indicator "G" on the Rubber Bush (6c) in new condition.

### **Wear Limit** (see "Z")

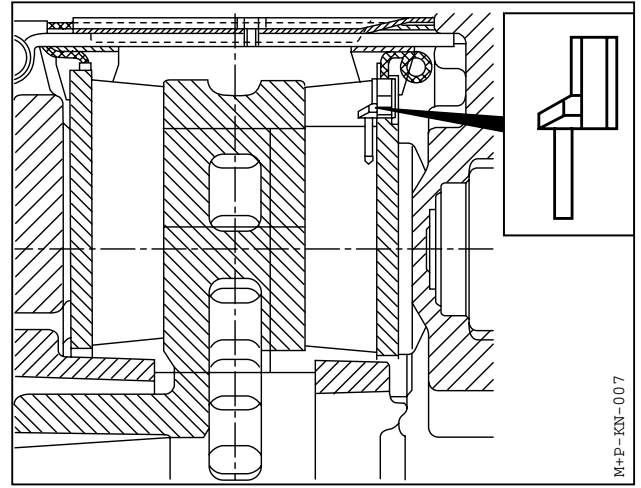
When the Rubber Bush (6c) is retracted to the level "G" of the Wear Indicator as shown, the wheel must be removed so that the wear of the Pads and Disc can be checked.

If necessary change the Pads - see Section 6 or the Disc - see Vehicle Manufacturer's recommendations.

### 5.1.4 Wear Indicators

Due to different Vehicle Manufacturer and vehicle types there are several types of Pad Wear Indicator used.

- a) In-pad Normally Closed Indicator - Circuit is broken when Pad Wear reaches limit.
- b) In-pad Normally Open Indicator - Circuit is made when Pad Wear reaches limit.

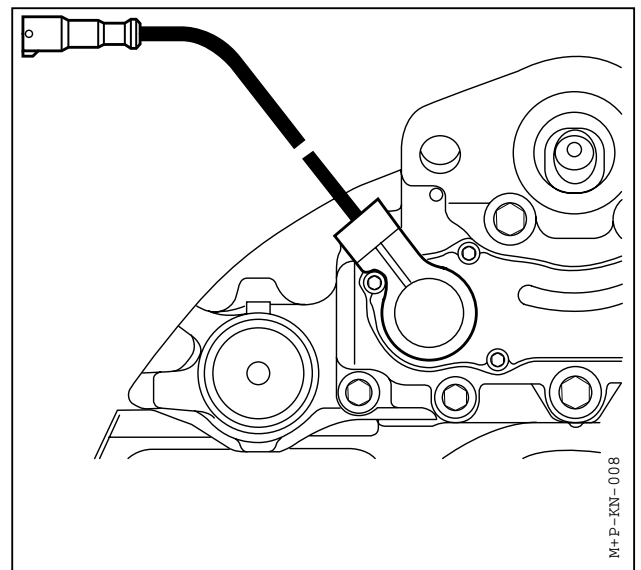


- c) Wear Indicator using built in Potentiometer. This is available either as an on/off version or as a continuous signal version which can be linked to the vehicle's electronic monitoring systems.

An optical or acoustic device may be linked to any of the above.

**Note:**

Please also refer to specifications provided by the Vehicle Manufacturer.



### 5.1.5 Diagnostic Equipment

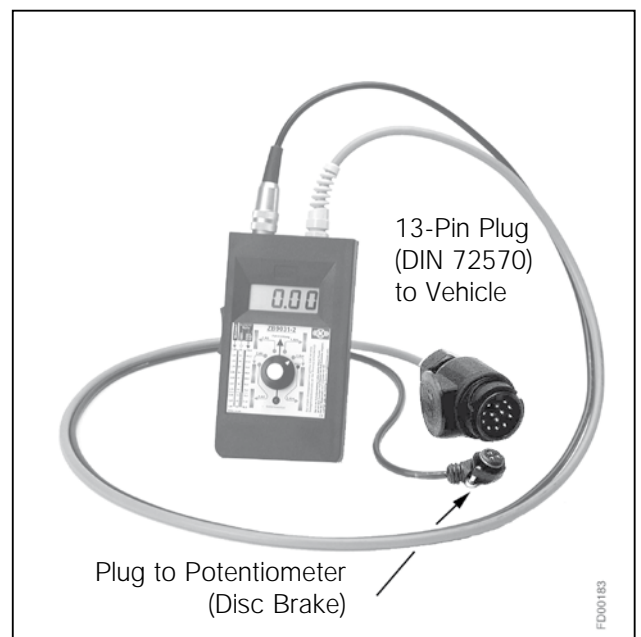
The Knorr-Bremse Diagnostic Unit ZB9031-2 is a hand held device suitable for vehicles that are fitted with Knorr-Bremse Disc Brakes using a continuous signal type of Wear Indicator Potentiometer.

The wear condition of each brake can be measured by connecting the device to a suitable 13 pin socket (DIN 72570) where fitted. This socket will have been connected to each sensor by the vehicle manufacturer.

The Diagnostic unit allows:

- Quick and simple wear check.
- A check of the potentiometer function.
- A simultaneous check of up to six brakes, without removing the wheels.

*A detailed instruction manual is included with each unit.*



## 5.2 Adjuster Check

### 5.2.1 Version without Shear Adapter (61)

#### **ATTENTION!**

*Before starting service work, ensure the service brake and parking brake, as well as the bus stop brake with buses, are not applied and that the vehicle cannot roll away.*

Remove wheel.

The caliper assembly should be pushed inboard on its Guide Pins. Using a suitable tool, press the inboard pad (12) away from the Tappets and check the gap between Tappet and inboard pad backplate - it should be between 0.5mm & 1.0mm. If the running clearance is too small or large, the adjuster may not be functioning correctly and should be checked as follows.

Remove Adjuster Cap (37).

#### **ATTENTION!**

*Do not overload or damage the Adjuster (23). Use only 8mm Ring Spanner or 1/4" drive Socket with a lever length no greater than 100mm. A maximum torque of 25 Nm is admissible.*

**DO NOT** use an Open Ended Spanner since this may damage the Adjuster shaft.

The Adjuster should be turned anti-clockwise for **3 clicks** (increasing running clearance).

#### **ATTENTION!**

*Make sure that the Ring Spanner or Socket can turn freely clockwise during following procedure.*

By applying the brake (to at least 2 Bar) 5 - 10 times the Spanner or Socket should turn clockwise in small increments if the Adjuster is functioning correctly (see notes below).

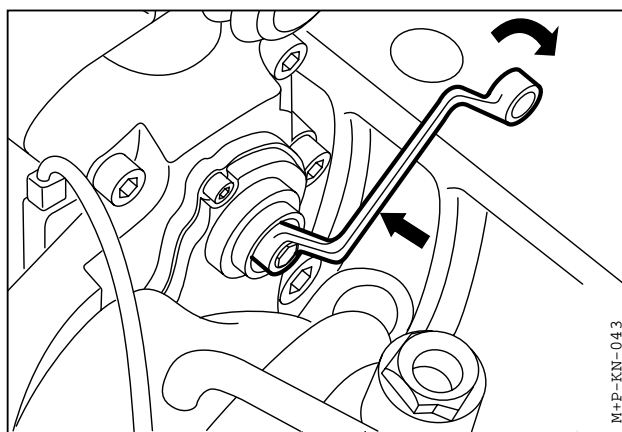
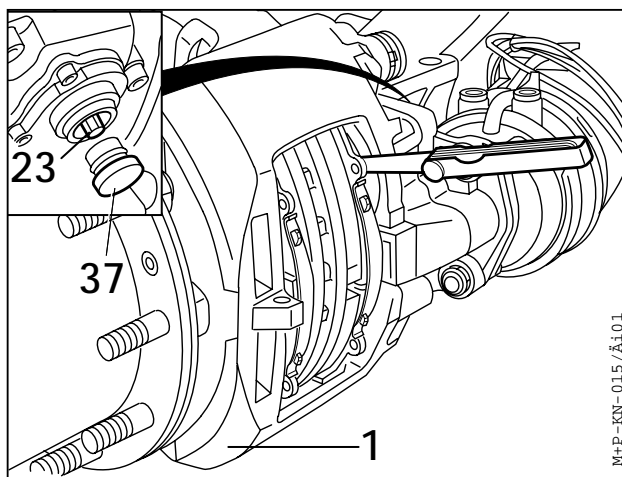
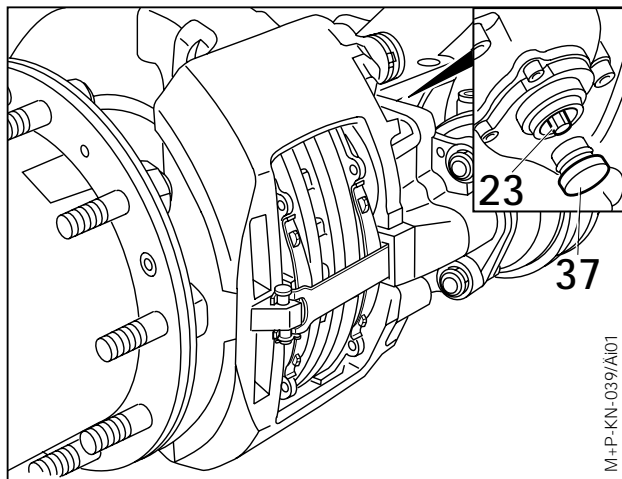
#### **NOTE:**

As the number of applications increases, incremental movement will decrease.

#### **NOTE:**

If the Spanner or Socket does not turn or turns only with the first application or turns forward and backward with every application, the automatic Adjuster has failed and the Caliper must be replaced.

Even if Pads are not being changed, a new Adjuster Cap (37) should be fitted having lightly greased it with **white** grease (available as Part No. II14525 or II32868).



## 5.2.2 Version with Shear Adapter (61)

### **ATTENTION!**

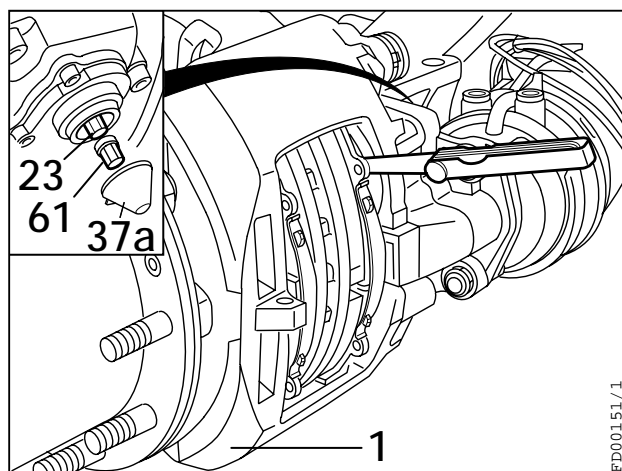
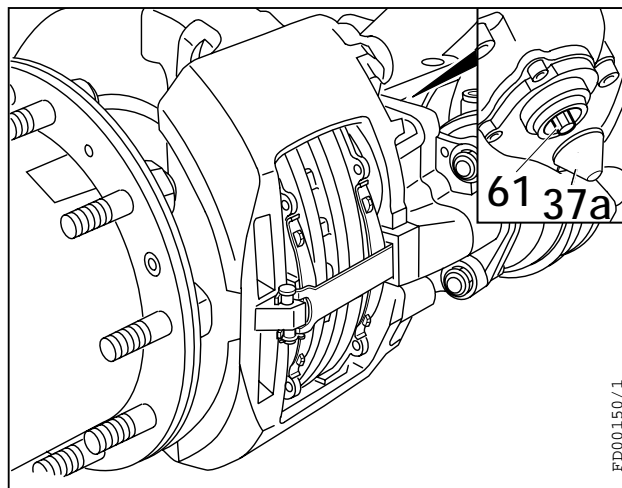
*Before starting service work, ensure the service brake and parking brake, as well as the bus stop brake with buses, are not applied and that the vehicle cannot roll away.*

Remove wheel.

The caliper assembly should be pushed inboard on its Guide Pins. Using a suitable tool, press the inboard pad (12) away from the Tappets and check the gap between Tappet and inboard pad backplate - it should be between 0.5mm & 1.0mm. If the running clearance is too small or large, the adjuster may not be functioning correctly and should be checked as follows.

Pull off the Adjuster Cap (37a) using the tag, taking care not to lose the Shear Adapter (61).

The Adjuster (23) must be turned with the Shear Adapter (61) anti-clockwise for **3 clicks** (increasing running clearance).



### **ATTENTION!**

*Never turn Adjuster (23) without Shear Adapter (61) being fitted. If the given shear torque of the Shear Adapter is exceeded, then it is destroyed. Try with a new (unused) Shear Adapter. With a second failure of the Shear Adapter the Caliper must be exchanged since internal damage is present. Do not use an open ended spanner, because it may damage the Shear Adapter (61).*

### **ATTENTION!**

*Make sure that the Ring Spanner or Socket can turn freely clockwise during following procedure.*

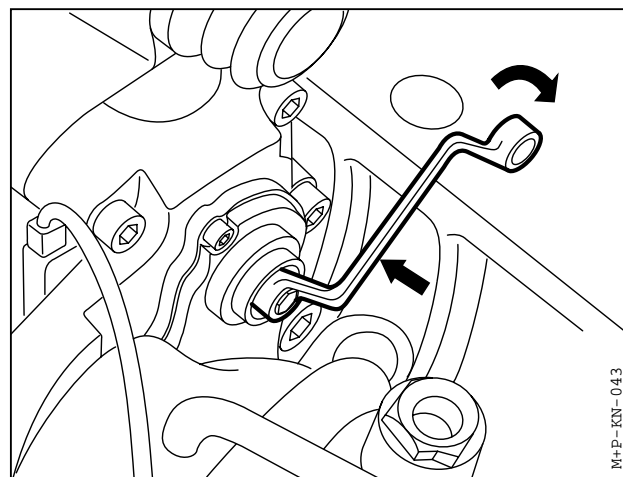
By applying the brake (to at least 2 Bar) 5 - 10 times the Spanner or Socket should turn clockwise in small increments if the Adjuster is functioning correctly (see notes below).

#### **NOTE:**

As the number of applications increases, incremental movement will decrease.

#### **NOTE:**

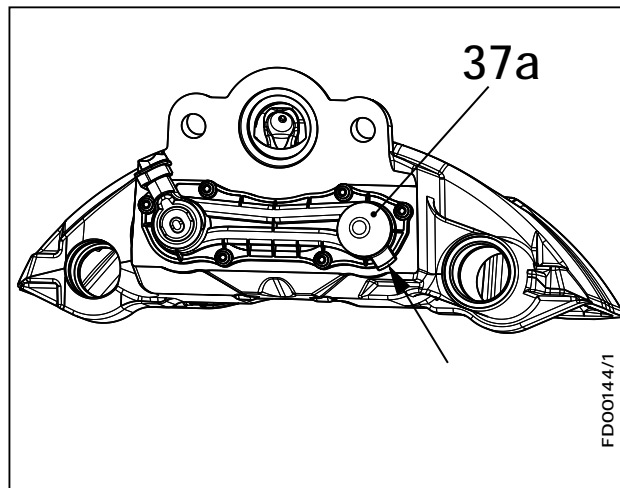
If the Spanner or Socket does not turn or turns only with the first application or turns forward and backward with every application, the automatic Adjuster has failed and the Caliper must be replaced.



Even if Pads are not being changed, a new Adjuster Cap (37a) should be fitted having lightly greased it with **white** grease (available as Part No. II14525 or II32868).

**Note:**

The tag of the Adjuster Cap (37a) should be positioned as shown by the arrow in the adjacent diagram. This ensures access is maintained for subsequent removal. Removal of the Adjuster Cap with e.g. a screwdriver is not recommended since the seal may be damaged.





## 5.3 Caliper Checks

### 5.3.1 Caliper Running Clearance

#### **ATTENTION!**

*Before starting service work, ensure the service brake and parking brake, as well as the bus stop brake with buses, are not applied and that the vehicle cannot roll away.*

By pushing and pulling the Caliper in an axial direction by hand (see arrow A in adjacent sketch), a movement of 0,5 - 1.0 mm must be possible. If using hand pressure only (no tools) the Caliper is not movable, the Caliper guidance must be further examined (see Section 5.3.2).

### 5.3.2 Caliper Movement along Guide Pins

Remove Pads (see Section 6.1)

Clean dirt from Guide Pin (4a, 4b, 4c, 4d) (see arrows in Sketch).

Using hand pressure only (no tools), the Caliper (1) must slide freely along the whole length of the Guide Pin arrangement. This movement should be greater than 25mm.

### 5.3.3 Rubber Bush to Guide Pin Clearance

#### **Note:**

Before removing the wheel, note that there is no contact between Caliper and axle, vehicle, chassis sections or Carrier. If necessary the Rubber Bush (6a, 6b, 6c, 6d), must be replaced (see Section 10.2, 10.3).

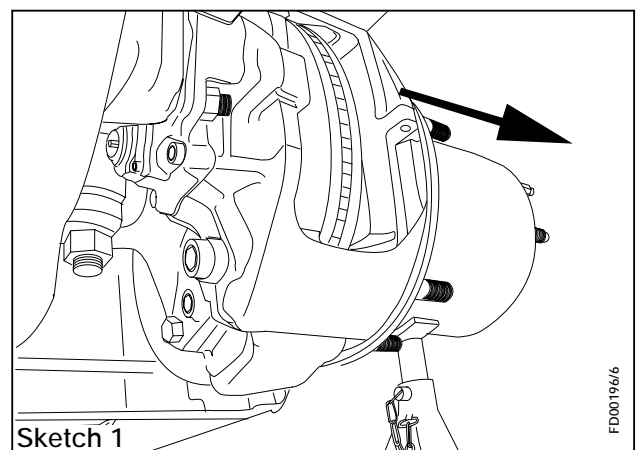
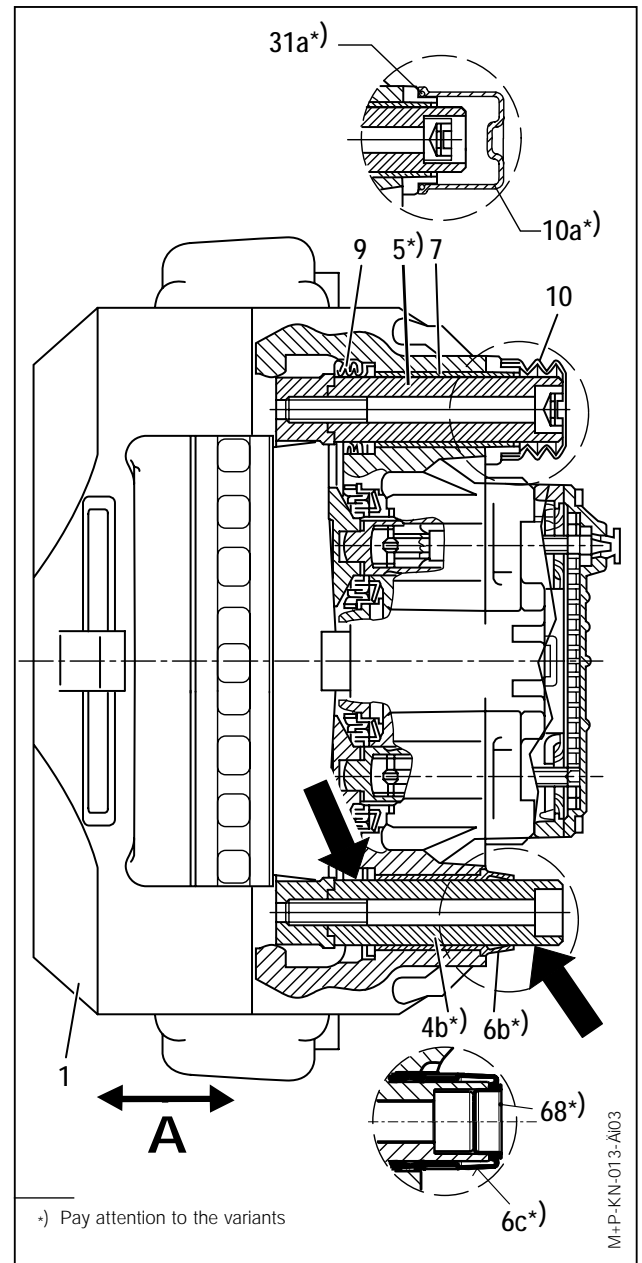
To measure the clearance, the following steps must be taken:

Remove the wheel. Refer to Vehicle Manufacturer's recommendations.

Remove Pads (see Section 6.1).

Fully wind-back the Tappet and Boot Assemblies (13) by rotating the Adjuster (23) in an anti-clockwise direction (see Section 5.2.1, 5.2.2).

Slide Caliper as far as possible towards the outside of the vehicle (see Sketch 1).



Push the Caliper in the direction of the arrow (see Sketch 2).  
Note that there is no contact between Caliper and axle, vehicle, chassis sections or Carrier. If necessary the Rubber Bush (6a, 6b, 6c, 6d), must be replaced (see Section 10.2 and 10.3).

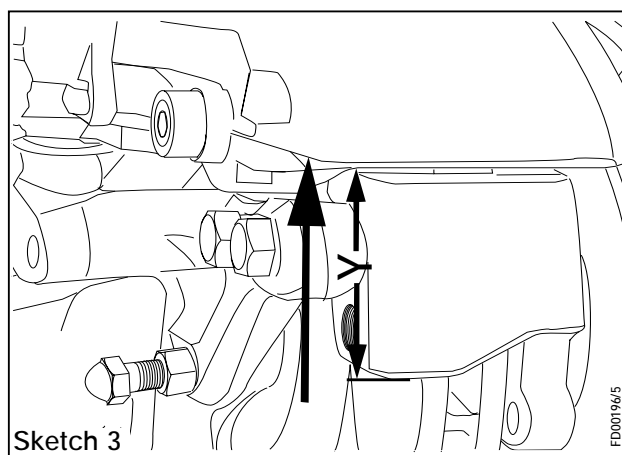
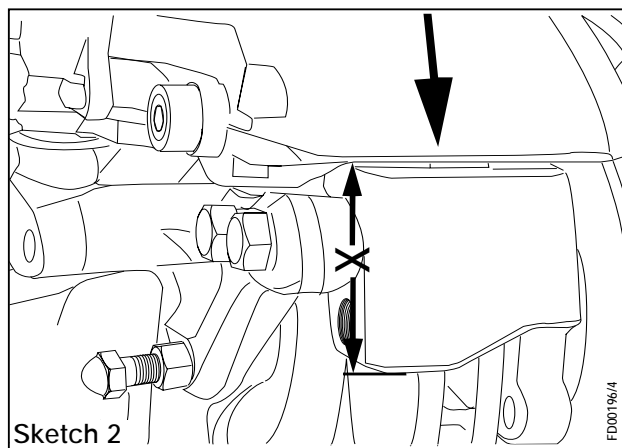
Whilst maintaining pressure on the Caliper, measure the distance 'x' (see Sketch 2).

Pull the Caliper away from the Carrier and measure distance 'y' (see Sketch 3).

If the distance (y-x) is **greater than 3mm**, the Rubber Bush (6a, 6b, 6c, 6d) must be replaced (see Section 10.2 and 10.3).

Fit Pads (see Section 6.2).

Fit the wheel. Refer to Vehicle Manufacturer's recommendations.



## 5.4 Check of Seals

### 5.4.1 Caliper Guide Pin Seals

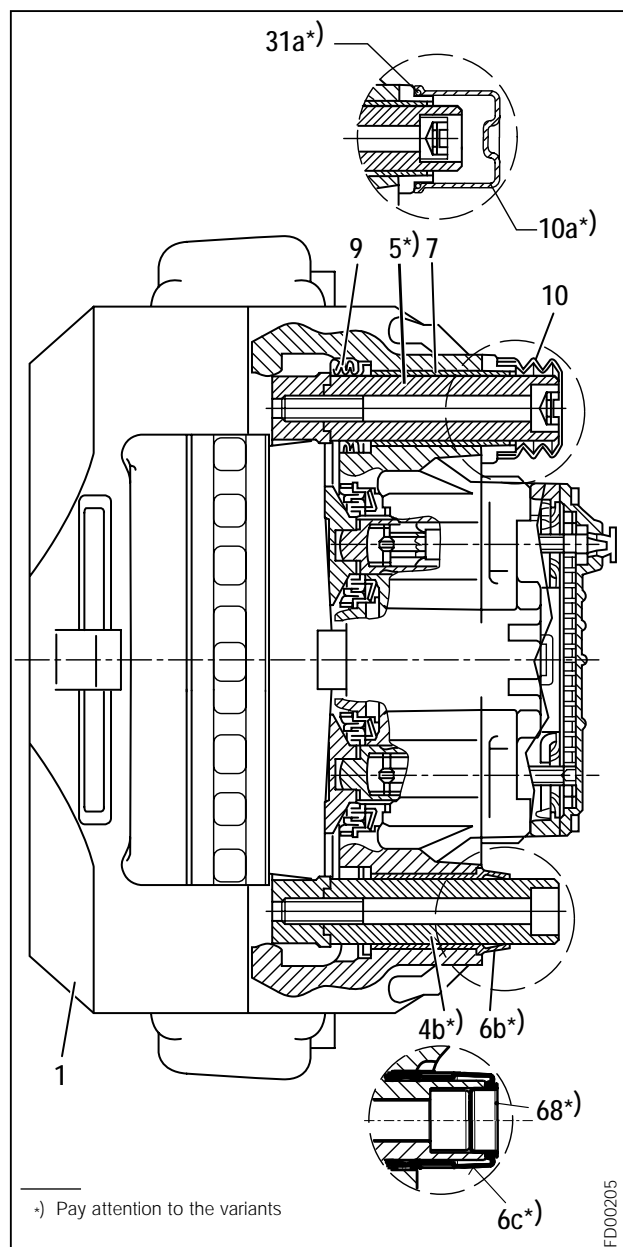
The Guide Pin (5, 5a) is sealed with the Inner Boot (9) and the Adjuster Cap (10) or the Steel Cap (10a) and the O-Ring (31a). The items (9) and (10) or (10a) must not show signs of cracking or damage. On versions with Rubber Bush (6c) this is also to be checked for damage.

Check for correct location and fitment.

**Note:**

It may be necessary to remove the Pads to inspect the Inner Boot (9) - dependant on the amount of pad wear.

If necessary repair Caliper with suitable Service Kit (see Section 1.2 or 1.4).



### 5.4.2 Check of Tappet and Boot Assembly (13)

If necessary remove Pads (12) (see Section 6.1) and screw the Adjuster (23) clockwise (see Section 5.2.1, 5.2.2) until the boots are clearly visible.

**Note:**

The tappets should not extend more than 30 mm (see sketch).

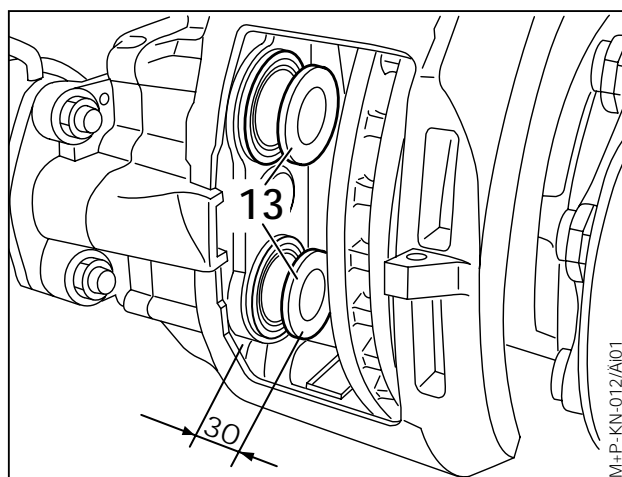
The Tappet and Boot Assemblies (13) must not show any signs of damage.

Check for correct location and fitment.

**Note:**

The penetration of dirt and humidity into the brake will lead to corrosion and impair the function of the Disc Brake.

If necessary replace Tappet and Boot Assemblies (see Section 7).



## 6 Pad Replacement

(for Axial- and Radial Disc Brakes)

### **ATTENTION!**

*Before starting repair work, ensure the service brake and parking brake, as well as the bus stop brake with buses, are not applied and that the vehicle cannot roll away.*

### 6.1 Pad Removal

Remove wheel (refer to Vehicle Manufacturer's recommendations).

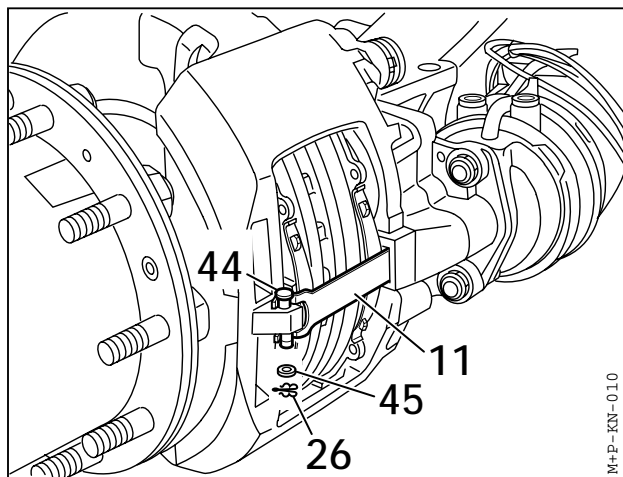
#### **Note:**

Before removing Pads it is strongly recommended that the Adjuster mechanism is checked for correct operation (see Section 5.2).

Remove Clip (26) and Washer (45), depress the Pad Retainer (11) and remove Pin (44).

If necessary remove any in-pad wear sensor components and discard.

If the Pad Retainer (11) is corroded or damaged, it should be replaced.



#### 6.1.1 Version without Shear Adapter (61)

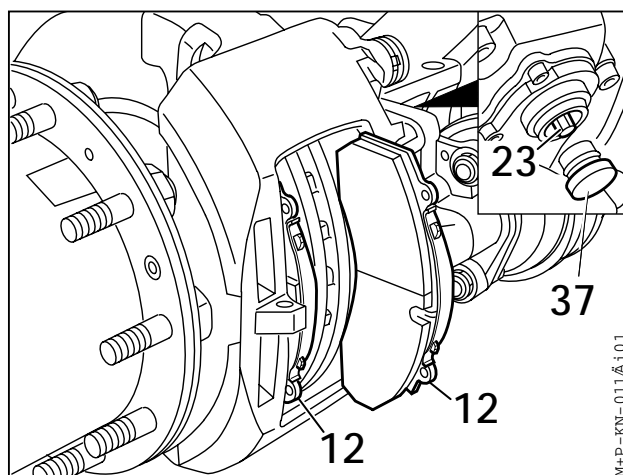
Remove Adjuster Cap (37).

Fully wind-back the Tappet and Boot Assemblies (13) by rotating the Adjuster (23) in an anti-clockwise direction (see Section 5.2.1).

### **ATTENTION!**

*Do not overload or damage the Adjuster (23). Use only 8mm Ring Spanner or 1/4" drive Socket with a lever length no greater than 100mm. A maximum torque of 25 Nm is admissible.*

**DO NOT** use an Open Ended Spanner since this may damage the Adjuster shaft.



Push inboard Pad (12) toward Actuator.

Pull out both Pads (12).

### 6.1.2 Version with Shear Adapter (61)

Pull off the Adjuster Cap (37a) using the tab, taking care not to lose the Shear Adapter (61).

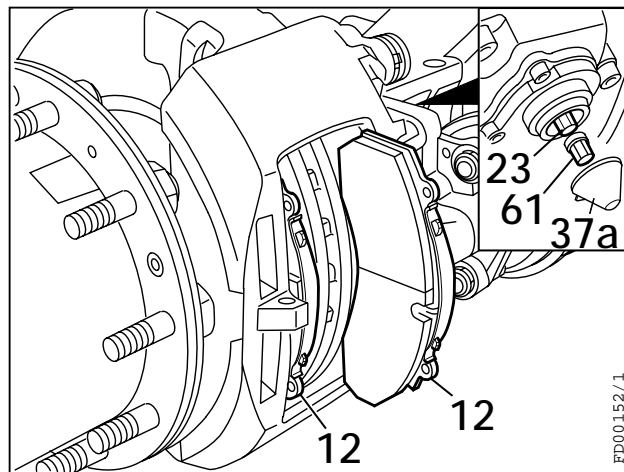
Fully wind-back the Tappet and Boot Assembly (13) by rotating the Adjuster (23) in an anti-clockwise direction (see Section 5.2.2).

#### **ATTENTION!**

*Never turn Adjuster (23) without Shear Adapter (61) being fitted. If the given shear torque of the Shear Adapter is exceeded, then it is destroyed. Try with a new (unused) Shear Adapter. With a second failure of the Shear Adapter the Caliper must be exchanged since internal damage is present. Do not use an open ended spanner, because it may damage the Shear Adapter (61).*

Push inboard Pad (12) toward Actuator.

Pull out both Pads (12).



## 6.2 Pad Fitting

### **ATTENTION!**

*Pads must be changed as an axle set and NOT individually. Use only Pads which are permitted by the vehicle manufacturer, axle manufacturer and disc brake manufacturer. Failure to comply with this may invalidate the vehicle manufacturer's warranty*

#### Note:

Fully wind-back the Tappet and Boot Assemblies (13) by rotating the Adjuster (23) in an anti-clockwise direction (see Section 5.2.1, 5.2.2) - Do not overload the Adjuster (23).

Clean the Pad abutments.

Push Caliper (1) outboard and fit the outboard Pad (12).

Push Caliper (1) inboard and fit the inboard Pad (12).

Fit new In-pad Wear Indicator kit, if appropriate (see Section 6.3 and 1.2.1 or 1.4.1).

Install the cable so that it can not be damaged.

Rotate the Adjuster clockwise until the Pads come into contact with the Disc - Do not overload the Adjuster (23).

Then turn back the Adjuster **3 clicks** (see Section 5.2.1, 5.2.2).

The hub should turn easily by hand after having applied and released the brake.

The Adjuster Cap (37 or 37a) must then be replaced (use only a new Cap) having lightly greased it with white grease (available as Part No. II14525 or II32868).

#### Note:

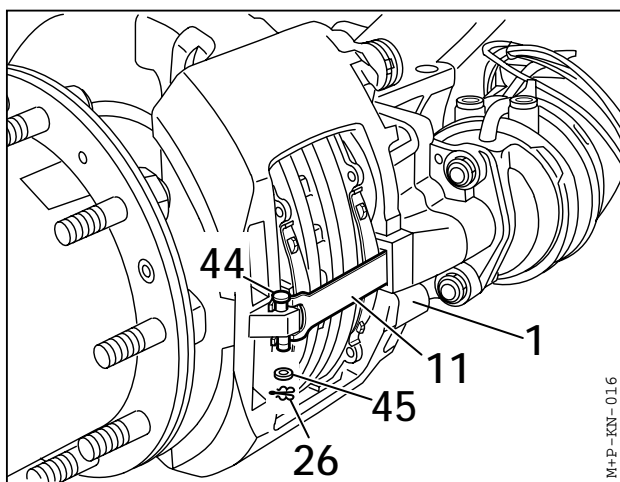
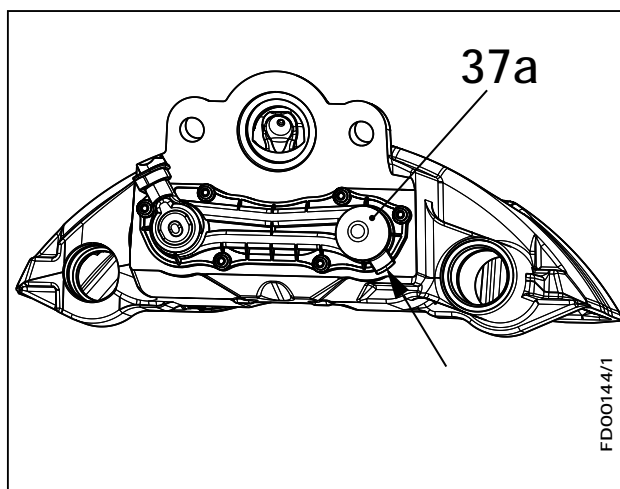
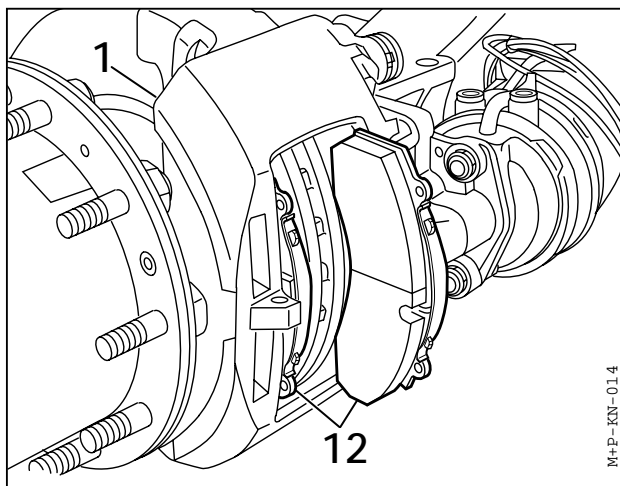
The tag of the Adjuster Cap (37a) should be positioned as shown by the arrow in the adjacent Sketch. This ensures access is maintained for subsequent removal. Removal of the Adjuster Cap with e.g. a screwdriver is not recommended since the seal may be damaged.

After setting the Pad Retainer (11) into the groove of the Caliper (1), it must be depressed to enable the positioning of Pad Retainer Pin (44).

Fit washer (45) and Spring Clip (26) to the Pad Retainer Pin (44) (use only new parts).

It is recommended that Pad Retainer Pin (44) is installed pointing downwards (see Sketch).

Re-fit wheel according to the Vehicle Manufacturer 's recommendations.



### **ATTENTION!**

*New Pads need bedding in. Heavy or long duration braking should initially be avoided.*

### 6.3 Wear Indicator Fitting

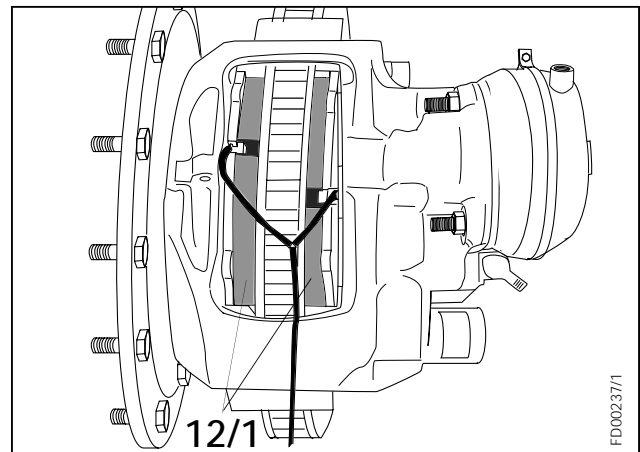
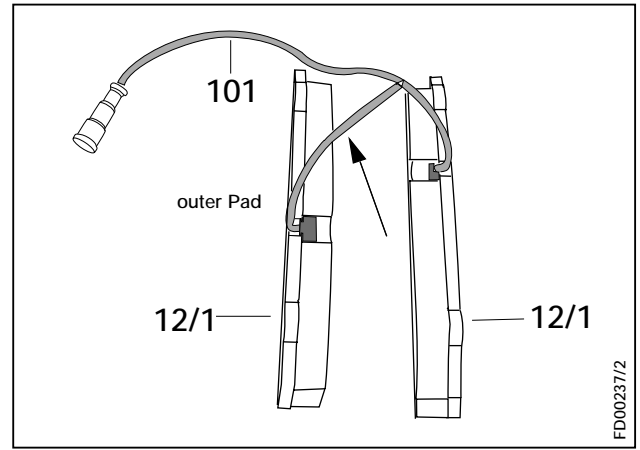
(Normally Closed or Normally Open Type)

Remove Pads (12) - see Section 6.1.

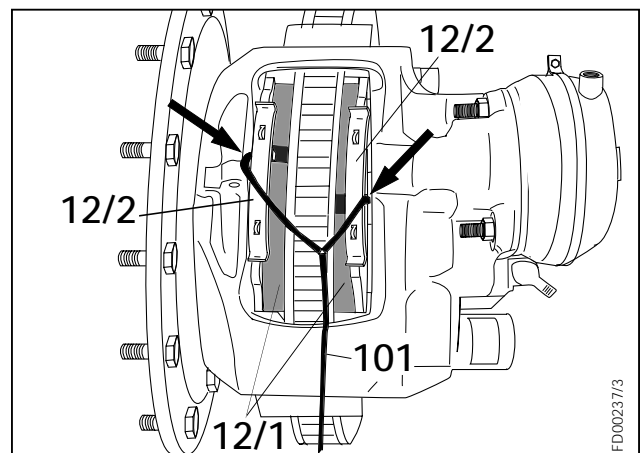
Wear Indicator Kits (for **SB6...** / **SB7...**) consist of items as shown in Section 1.2.1 and 1.4.1.

Insert the Wear Indicator Cables (101) into the groove of the Pads. The Wear Indicators snap into place in the holes in the Pad material.  
The longer end of the Wear Indicator cable (see arrow) must be fitted in the outer Pad.

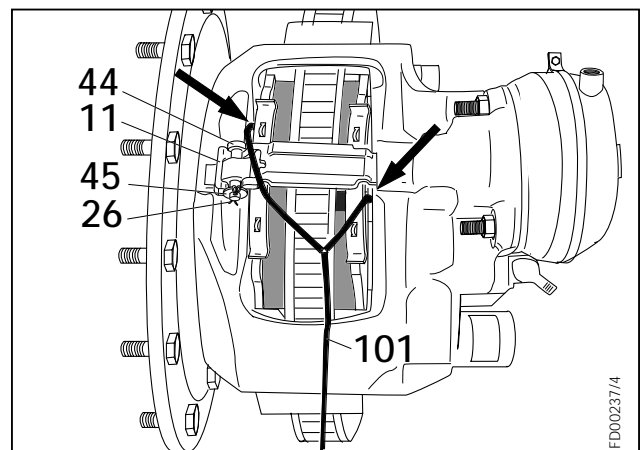
Insert Pads (12/1) into the Pad abutments (see Section 6.2).



Fit Pad Holder Springs (12/2) onto the Pads (12/1). Pay attention to correct installation of Wear Indicator Cable (101) (see arrows).

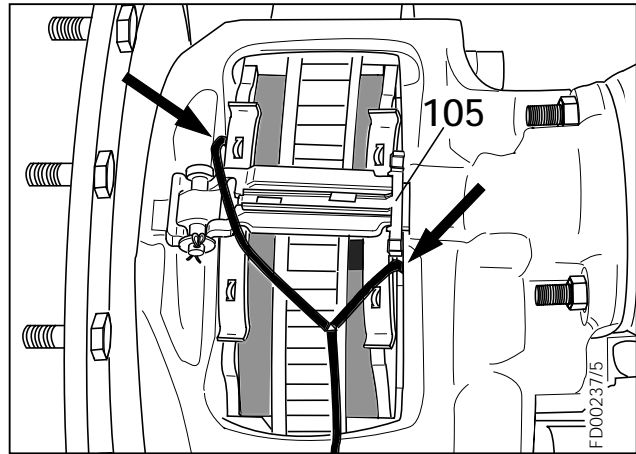


Fit Pad Retainer (11), Pad Retainer Pin (44), Washer (45) and Spring Clip (26) (see Section 6.2). Pay attention to correct installation of the Wear Indicator Cable (101) (see arrows).

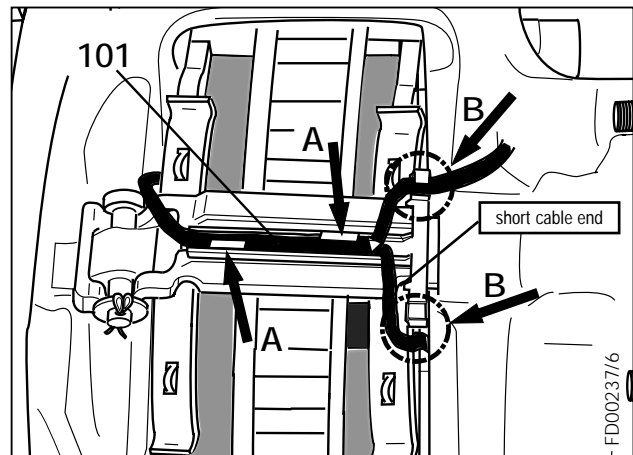


### 6.3.1 Cable Guide Type (105)

Fit Cable Guide (105) onto the Pad Retainer (11).  
In the right position, the Cable Guide (105) snaps into place by pressing it lightly onto the Pad Retainer (11).

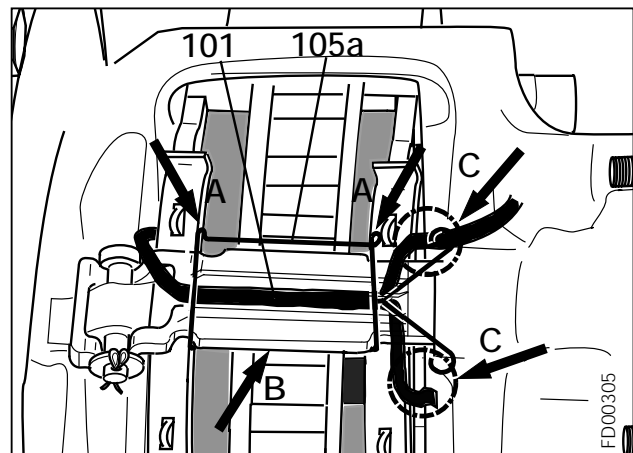


Press Wear Indicator Cable (101) into the locating tabs of the Cable Guide (105) (see arrows A).  
The short cable end of the Wear Indicator Cable (101) **must not** be secured by locating tabs of the Cable Guide (105).  
According to vehicle type, install the cable loom that leads to the electrical supply of the vehicle, in one of the two locating tabs (see arrows B).



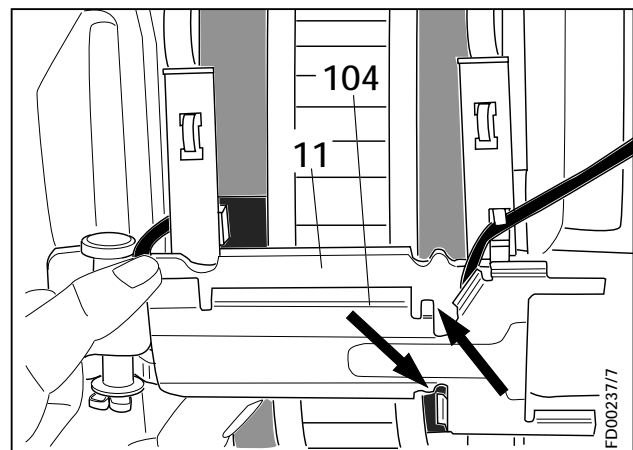
### 6.3.2 Cable Guide Type (105a)

Install Indicator Cable (101) in the middle of the Pad Retainer (11).  
Insert Cable Guide (105a) at one side of the Pad Retainer (11) (see arrow B).  
Slightly press in on the other side of the Pad Retainer (11) (see arrows A). The Cable Guide (105a) snaps into place.  
According to vehicle type, install the cable loom that leads to the electric supply of the vehicle, in one of the wire loop (see arrows C).  
The short end of the Wear Indicator Cable (101) **must not** be secured by a wire loop of the Cable Guide (105a) (see arrows C).



### 6.3.3 Protection Plate (104)

Fit the Cable Protection Plate (104).  
Pay attention to the correct position of the Cable Protection Plate's catch (see arrows).  
Exert hand pressure to the Cable Protection Plate (104); it will snap into place.





## 7 Replacement of Tappet and Boot Assemblies (13) as well as Inner Seals (22) .

(for Axial and Radial Disc Brakes)

The components of the tools are referred to by item number for ease of reference.

To remove the Tappet and Boot Assembly (13) use the Wedge Fork (A) (Part No. II32203).

To fit the Tappet and Boot Assembly (13) use the Press-in Tool (B) (Part No. II19252).

To fit the Inner Seal (22), use the Press-in Tool (L) (Part No. Z004361).

### 7.1 Tappet and Boot Assemblies (13) Removal

#### Note:

It may be easier to remove the Caliper from the axle to replace the Tappet and Boot Assemblies (13) (see Section 8.1).

The Adjuster (23) must be screwed clockwise until the Boots can be reached (max. 30 mm) (see Section 7.1.1).

To remove the Tappet Boot from the Caliper bore, a Screwdriver should be used to deform the Boot location ring - see diagram.

#### **ATTENTION!**

*Great care must be taken not to damage the Sealing Seat of the Tappet Boot since it is not a replaceable item.  
See arrow X in adjacent Sketch.*

The Tappet and Boot Assemblies (13) can be removed from the Threaded Tubes (16) by using Wedge Fork (A) (Part No. II32202).

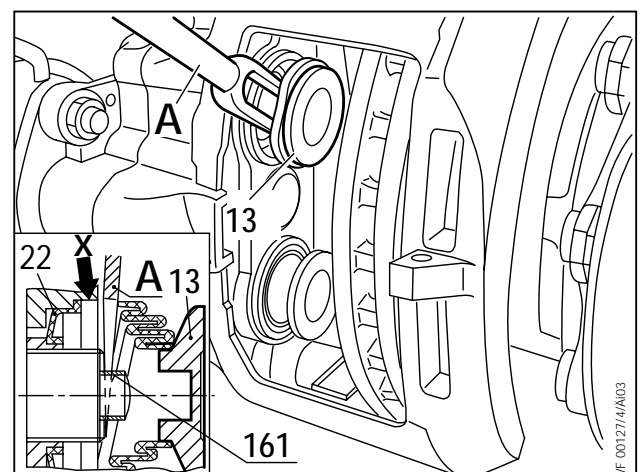
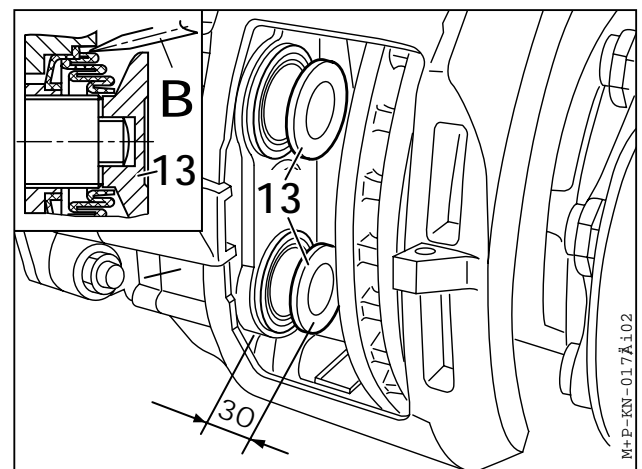
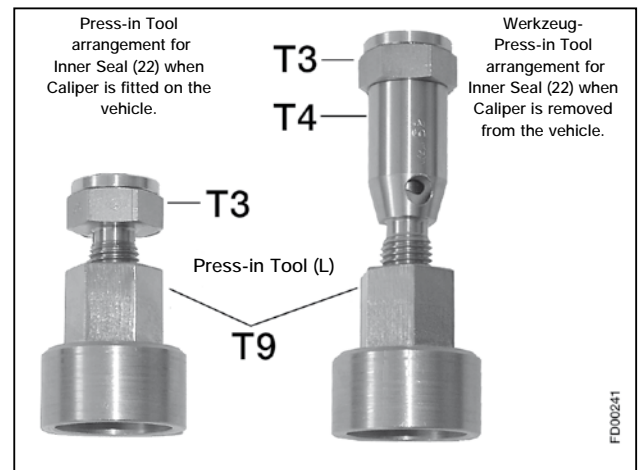
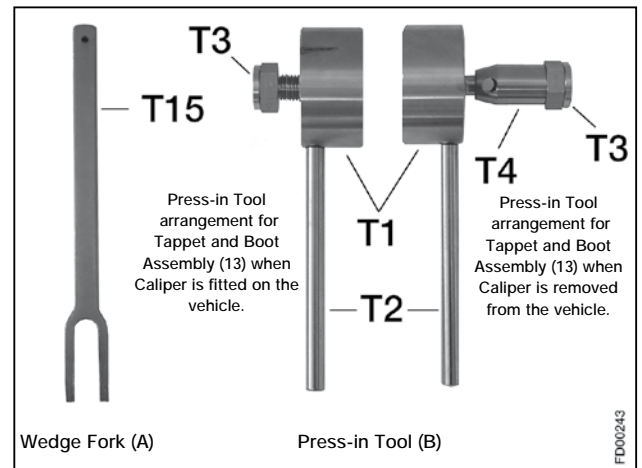
Remove the old Tappet Bush (161).

Check Inner Seal (arrow X) and if damaged, the Caliper must be replaced (see Section 8).

#### Note:

If the sealing seat of the Tappet Boot has been damaged the caliper must be replaced (see Section 8.1).

The Inner Seal (22) must also be replaced if Tappet and Boot Assemblies (13) have been removed (see Section 7.2).



### 7.1.1 Threaded Tubes (16) Inspection

Place an unworn Pad (12) into the outboard gap to avoid overrunning of the Threaded Tubes.

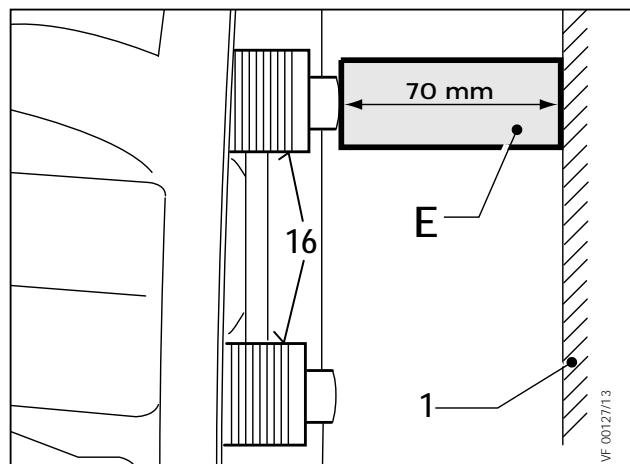
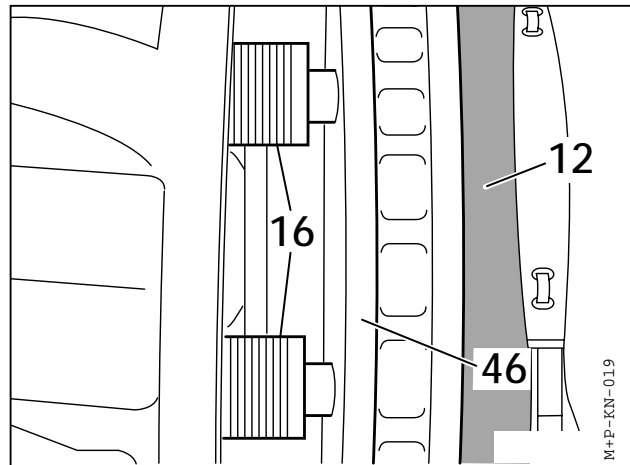
#### **ATTENTION!**

*Threaded Tubes should not overrun the inner thread of the Bridge.  
The Caliper must be replaced if synchronisation is lost.*

For the inspection of the threads, the tubes must be screwed out (max. 30mm) by turning the Adjuster (23) clockwise.

If Caliper is not installed on axle, put a spacer E (length = 70mm) into the Caliper (1) to avoid overrunning of the Threaded Tubes (16) when screwing them out (see adjacent Sketch). During screwing, the threads can be checked for corrosion damage.

In case of water ingress or corrosion, the Caliper must be replaced (see Section 8).



### 7.2 Inner Seals (22) Replacement

Fully wind back the Threaded Tubes (16) by turning the Shear Adapter (61) anti-clockwise (see Section 5.2).

Clean area of the Inner Seal (22).

To remove the Inner Seal (22) a Screwdriver (A) should be used - see adjacent Sketch.

#### **ATTENTION!**

*The sealing face (X) for the Inner Seal (22), as well as the Threaded Tubes (16) must not be damaged. They cannot be replaced (see Section 7.1).*

Clean sealing face (X) .

Fit each Inner Seal (22) onto a Threaded Tube (16).

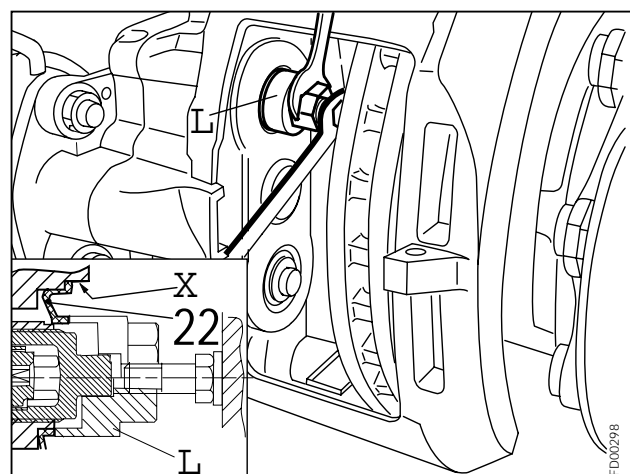
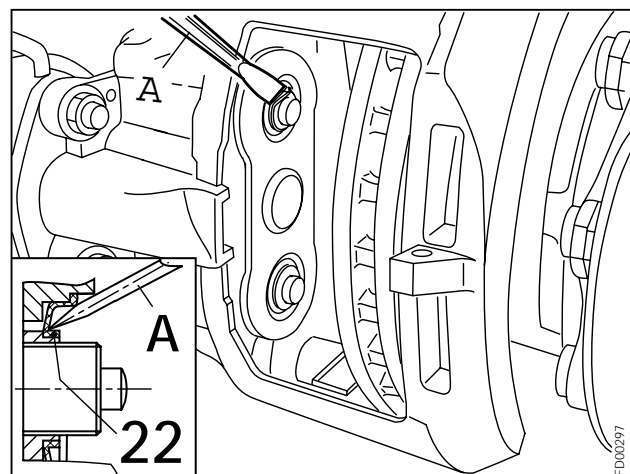
**With Caliper installed on axle**

Remove the Tappet Bush (161).

Position Tool (L) (Part No. Z004361) with the short strut in the position shown.

The Tool (L) is guided over the spigot of the Threaded Tube (16).

Fully press in the Inner Seal (22) by rotating Tool (T3) using a spanner - see adjacent Sketch.

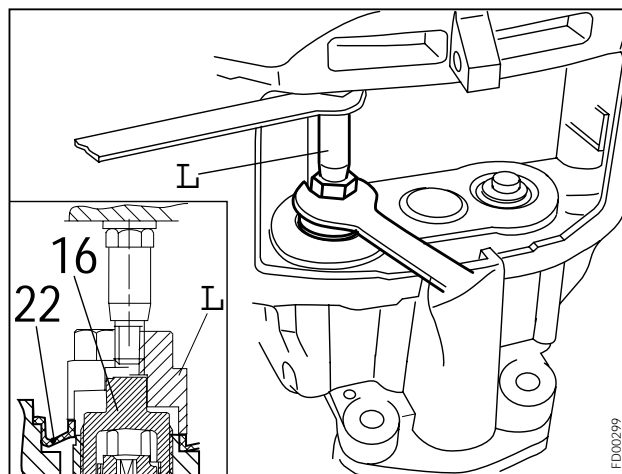


To check the correct fit of the Inner Seal (22), screw out the Threaded Tubes (16) about 4-5 threads by turning the Adjuster (23) or (according Version) with Shear Adapter (61) clockwise.  
The Inner Seal (22) must not turn.

#### With Caliper not installed on axle

The fitting sequence of Inner Seal (22) does not change.

When pressing in the Inner Seal (22) however, use the long strut (T3+T4) for Tool (L) (Part No. Z004361) - see page 33.



### 7.3 Tappet and Boot Assemblies (13) Fitting

#### With Caliper installed on axle:

Grease threads with **white** grease (Part No. II14525 or II32868).

Screw back Threaded Tubes (16), by turning the Adjuster (23) or (according Version) with Shear Adapter (61) anti-clockwise (see Section 5.2.1, 5.2.2).

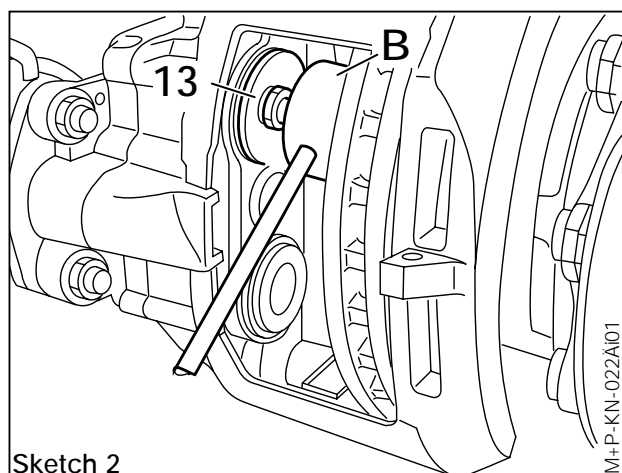
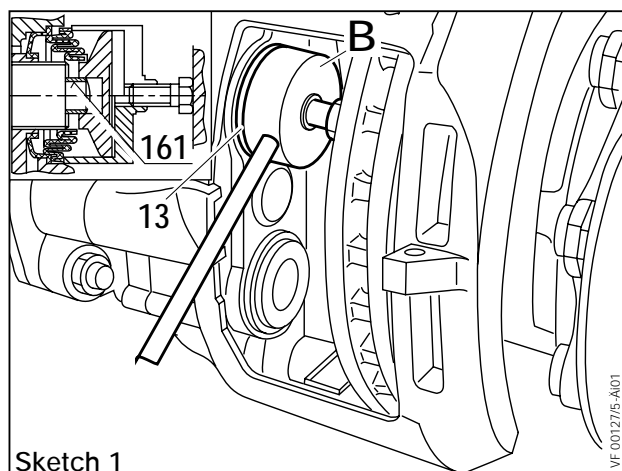
The sealing seat in the caliper for Tappet and Boot Assemblies (13) must be clean and free of grease.

Place new Tappet Bush (161) onto the spigot of the Threaded Tube (16).

Place Tappet and Boot Assembly (13) onto the Tappet Bush.

Use Push-in Tool (B) with the short strut (T3) (Part No. II19252) for positioning and pressing-in the Boot - see Sketch 1.

Using Tool (B) in reverse, the Tappet can be pressed onto the Tappet Bush - see Sketch 2.



### With Caliper not installed on axle

Grease threads with **white** grease (Part No. II14525 or II32868).

Screw back Threaded Tubes (16), by turning the Adjuster (23) or (according Version) with Shear Adapter (61) anti-clockwise (see Section 5.2.1, 5.2.2).

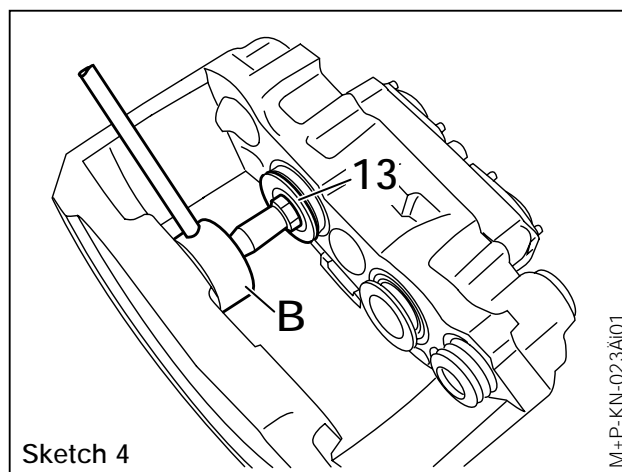
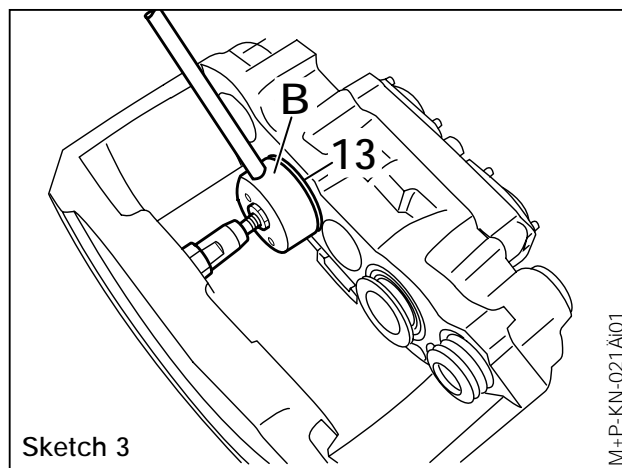
The sealing seat in the caliper for Tappet and Boot Assemblies (13) must be clean and free of grease.

Place new Tappet Bush (161) onto the spigot of the Threaded Tube (16).

Place Tappet and Boot Assembly (13) onto the Tappet Bush.

Use Push-in Tool (B) with the long strut (T3+T4) (Part No. II19252) for positioning and pressing-in the Boot, - see Sketch 3.

Using the Tool (B) in reverse, the Tappet can be pressed on to the Tappet Bush - see Sketch 4.



## 8 Caliper Replacement

(for Axial and Radial Disc Brakes)

To remove and to fit the Steel Cap (10a) use the Press-in Tool (G) (Part No. Z001105).

To fit the Cap (68) the Press-in Tool (K) (Part No. Z003934) must be used.

### 8.1 Caliper Removal

Remove Pads (see Section 6.1).

Remove Actuator (see Section 12.1, 12.3).

Disconnect Potentiometer Type Wear Indicator if fitted.

#### Note:

It may be necessary to remove the Caliper (1) and the Carrier (2) as a single unit, depending upon the vehicle installation, in line with vehicle manufacturer's recommendations.

Proceed as follows if the Caliper (1) is to be removed from the Carrier (2), with the Carrier remaining on the vehicle.

Remove Outer Boot Clip (31) and take off Outer Boot (10), or on Calipers with Steel Cap (10a) and O-Ring (31a), place tool (G) (Part No. Z001105) onto the Steel Cap and tighten the threaded pins. Then use hammer as shown.

On Calipers with Rubber Bush (6c) pull the Cap (68) from the Guide Pin (4c) using a suitable tool (see Sketch).

Remove Caliper Bolts (39a, 39b, 39c or 39d) and (40 or 40a).

#### **ATTENTION!**

*Before removing the Caliper Bolts (39 and 40) ensure that the Caliper (1) cannot move or fall when the Caliper Bolts are removed causing damage or injury.*

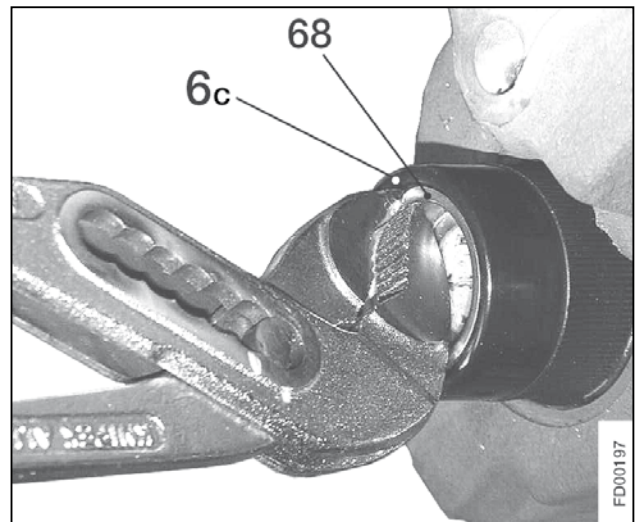
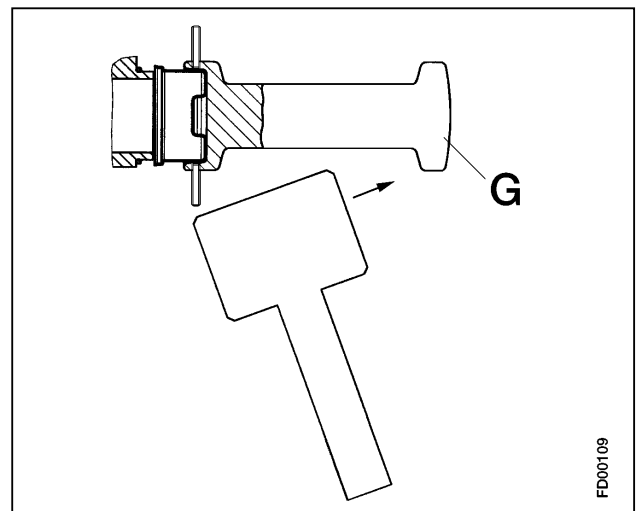
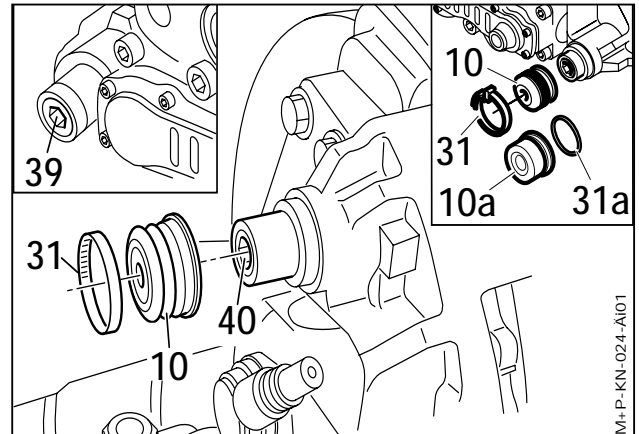
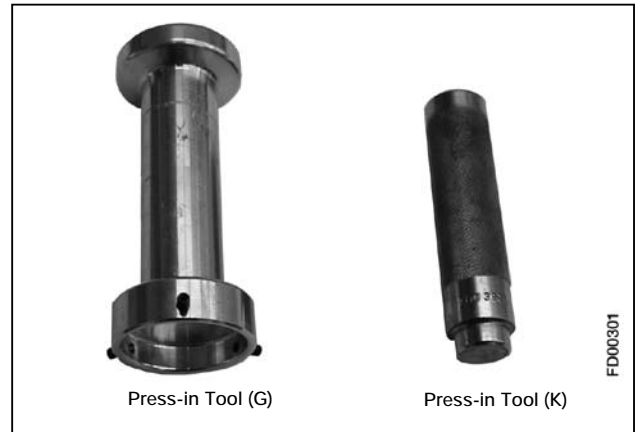
#### **ATTENTION!**

*Do not damage Rubber Bush (6c).  
If necessary replace it by means of a Rubber Bush and Guide Pin kit.*

#### **ATTENTION!**

*Hold Caliper only at its outer side.  
Never get your fingers between Caliper and Carrier!  
Do not fasten any lifting device to the Pad Retainer (11), since this can be damaged.*

Remove Caliper from Carrier.



### **ATTENTION!**

*The opening or dismantling of the Caliper is **not authorised**.  
Use only Genuine Knorr-Bremse Replacement Calipers.*

## **8.2 Caliper Fitting**

The correct choice of Caliper must be ensured by checking the part number on the identification label (see arrow in sketch 1) .

The replacement Caliper may have a plastic cap or adhesive tape in the area of the actuator attachment (see arrow in sketch 2). Remove the cap or tape after installing the caliper on the vehicle. Alternatively, if the replacement Caliper has a breakthrough diaphragm, it should be left in place (see arrow in sketch 3).

### **Note:**

The service exchange Caliper includes seals and Guide Pins. The Pads are not included.  
If the service exchange Caliper is equipped with a potentiometer, then the connectoin must be closed using the appropriate mating plug - refer to Vehicle Manufacturer's recommendations.

### **ATTENTION!**

*Hold Caliper only at its outer side.  
Never get your fingers between  
Caliper and Carrier!*

*Do not fasten any lifting device to the Pad Retainer (11), since this can be damaged.*

### **8.2.1 Fitting of Caliper (1) to Carrier (2)**

### **Note:**

It may be necessary for reasons of accessibility to fit the Caliper and Carrier assembly as a single unit to the vehicle - refer to Vehicle Manufacturer's recommendations.

### **ATTENTION!**

*Screw threads and tapped holes must be  
clean and dry (free of lubrication).*

### **ATTENTION!**

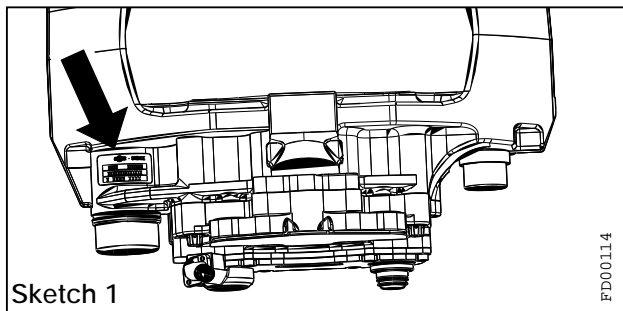
*The Guide Pins (4 and 5) as well as the  
Caliper Bolts (39 and 40) are highly  
stressed items. They must be replaced  
whenever the Caliper (1) is removed  
from the Carrier (2).*

Screw in Caliper Bolts (39a, 39b, 39c, 39d) and (40, 40a) and tighten to 180 Nm + 90°.

Check that the Caliper slides easily on the Guide Pins.

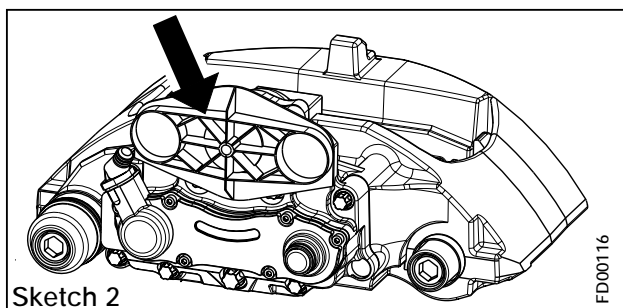
Check the position of the Inner Boot (9) on the Guide Pin (5, 5a).

Check Adjuster function (see Section 5.2).



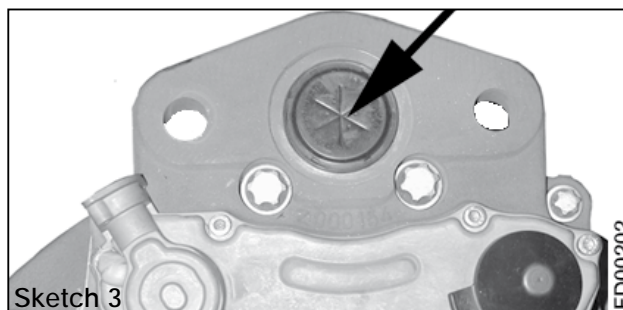
Sketch 1

FD00114



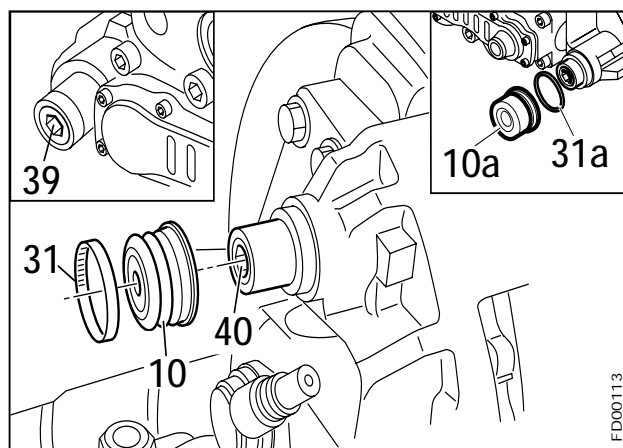
Sketch 2

FD00116

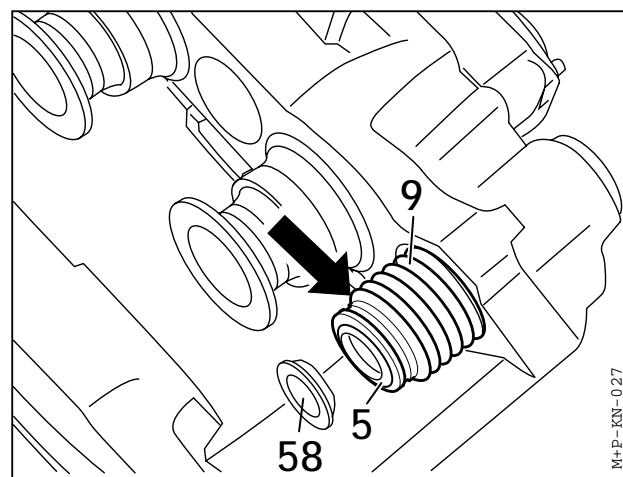


Sketch 3

FD00202



FD00113



M+P-KN-027

When the Caliper and Carrier Assembly with Steel Cap (10a) is not fitted to the vehicle, move the Caliper against the Carrier and retain using a suitable clamping device so that the Inner Boot (9) is in a compressed condition. This is to prevent air being trapped when Steel Cap (10a) is fitted.

Fit new Outer Boot (10) or Steel Cap (10a) (see Section 8.2.1, 8.2.2).

Fit the Pads, if not already fitted (see Section 6.2).

If the Caliper and Carrier Assembly is to be fitted as a single unit to the vehicle, do so in line with the Vehicle Manufacturer's recommendations.

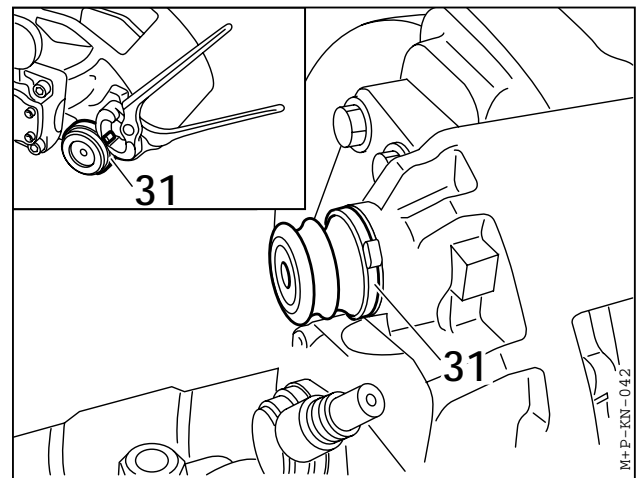
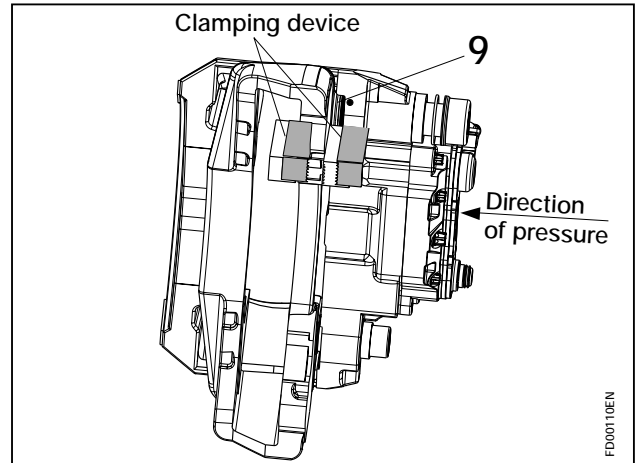
Attach Brake Chamber or Spring Brake (see Section 12.2 or 12.4).

### 8.2.2 Fitting of Outer Boot (10)

Check that the seat for the Outer Boot (10) on the Caliper (1) is free of grease and fit the Outer Boot.

Tighten Outer Boot Clip (31).

Pay attention to correct fitment of the Outer Boot Clip (31) and check Outer Boot (10) for damage.



### 8.2.3 Fitting of Steel Cap (10a)

#### **ATTENTION!** **Replacing Outer Boot (10) with Steel Cap (10a).**

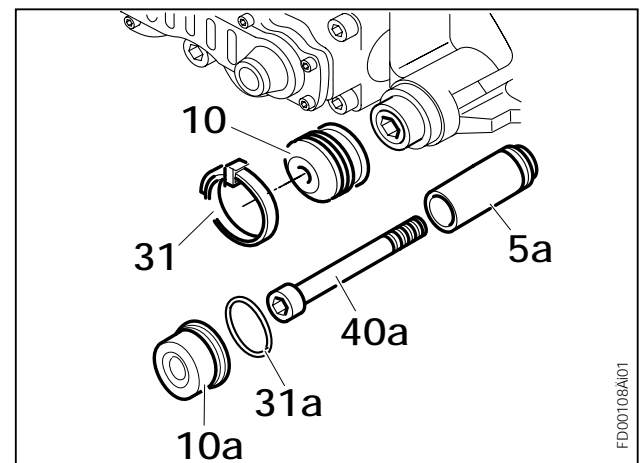
*This is only allowed if Guide Pin (5) and Caliper Bolt (40) are also replaced with the Guide Pin (5a) and Caliper Bolt (40a). Replace only with the permission of axle or Vehicle Manufacturer. On SB6... (19.5") Calipers, only permissible after manufacturing date A0026 (see identification table).*

#### **ATTENTION!**

*The Guide Pins (4 and 5) as well as the Caliper Bolts (39 and 40) are highly stressed items. They must be replaced whenever the Caliper (1) is removed from the Carrier (2).*

#### **ATTENTION!**

*The Steel Cap (10a) and the O-Ring (31a) must only be used once.*

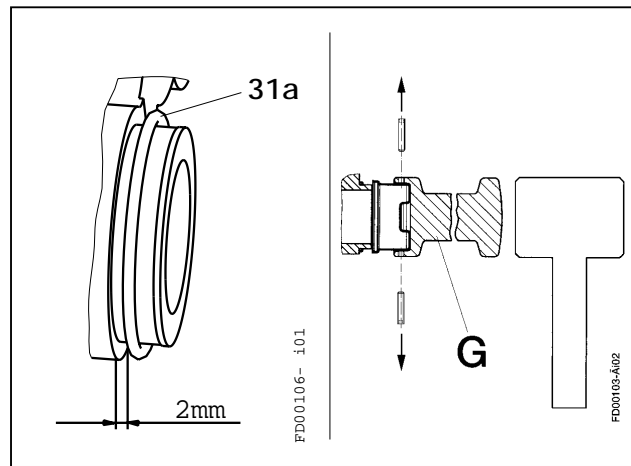




When the Caliper is on the vehicle the fitting of the Steel Cap (10a) must be carried out with the Pads installed.

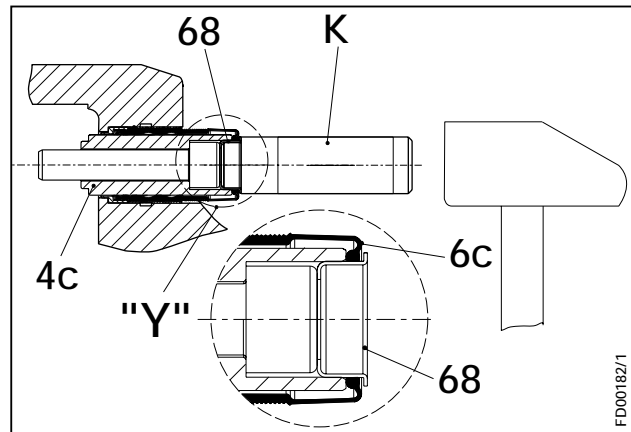
- Clean area.
- Using the **white** Grease supplied (II14525), lightly lubricate the O-Ring (31a) and place it over the cast spigot (see Sketch).
- Remove threaded pins from assembly tool G (Part No. Z001105) to avoid damaging the Steel Cap.
- Hold the new Steel Cap on the end of the spigot. By using a suitable press or assembly tool (G) and a hammer, press the Steel Cap fully on the spigot making sure not to deform the Cap.

After removal, the Steel Cap and the O-Ring must never be re-used.



#### 8.2.4 Fitting of Cap (68)

Fit the Cap (68) using Tool (K) (Part No. Z003934) and a hammer. Force the Cap (68) into the Guide Pin (4c) until it contacts the Caliper Bolt. The seal is achieved by the compression of the lip of the Rubber Bush (6c) between the Guide Pin (4c) and Cap (68) (see view "Y").





## 9 Replacement of Inner Boot (9)

(for Axial and Radial Disc Brakes)

To fit the Inner Boot (9) use the Pull-in Tool (C) (Part No. II19253).

Remove Caliper (see Section 8.1).

Remove Ring (58).

Pull out Guide Pin (5 or 5a).

Push out Inner Boot (9) with screwdriver.

### ATTENTION!

*The Sealing Seat of Inner Boot (9) in the Caliper must not be damaged (see arrow A in adjacent Sketch).*

Inspect and clean contact area of Inner Boot (9).

Check for corrosion (see arrow A in adjacent Sketch).

Check Brass Bush (7) for dirt and replace if damaged (see Section 10).

Put new Boot (9) into the Sleeve of the Tool (C) (Part No. II19253). See arrow B in adjacent Sketch.

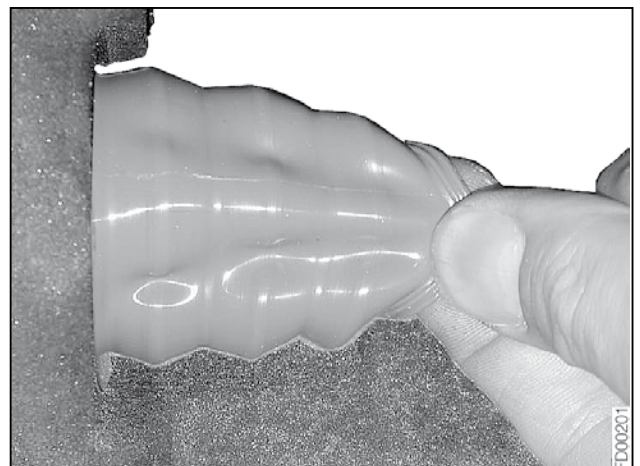
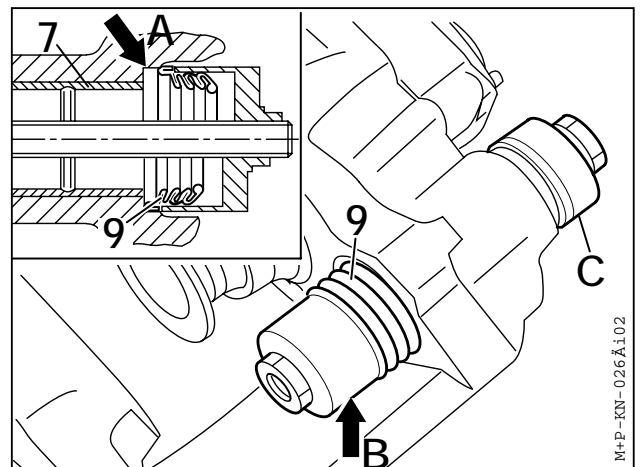
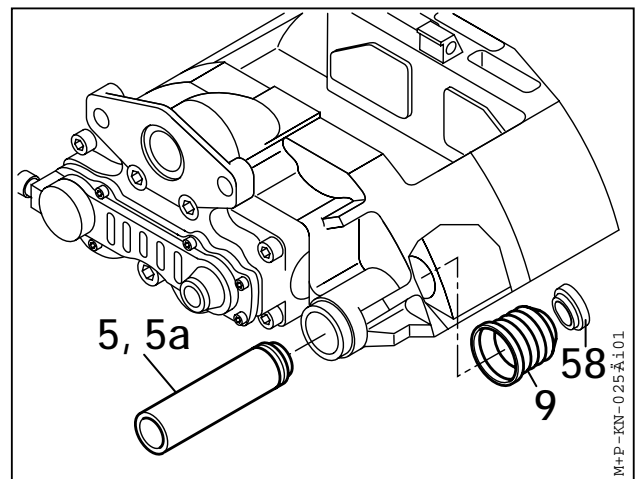
Pay attention that the Bellow-folds of Inner Boot (9) are positioned within the tool.

Position Sleeve with Inner Boot (9) into the Caliper bore and tighten by hand.  
Then pull in with a **maximum torque of 8 Nm**.

### Note:

Pay attention to the correct position of Inner Boot (9).

Carry out a pulling check (see adjacent Sketch).



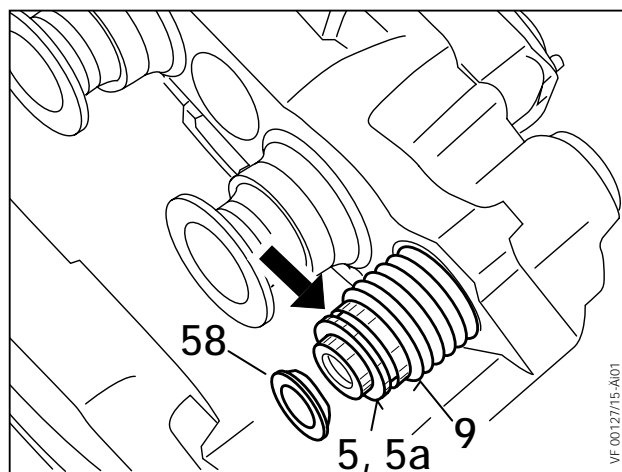
Grease Brass Bush (7) with **white** grease (Part No. II14525 or II32868).

Fit Guide Pin (5 or 5a).

The Boot end must engage in the groove of the Guide Pin (5 or 5a) (see arrow).

Fit Ring (58) by pushing until it engages.

Fit Caliper (see Section 8.2).



## 10 Guide Pin Bush Replacement (for Axial and Radial Disc Brakes)

In order to remove and fit Brass Bush (7) use the Pull-in/Pull-out Tool (D) (Part No. II19254).

To groove Brass Bush (7), Grooving Tool (F) (Part No. II36797) must be used.

Remove Caliper (see Section 8.1).

Remove Guide Pin (5 or 5a) and Inner Boot (9) (see Section 9).

### 10.1 Brass Bush (7) Replacement

Pull out Brass Bush (7) with Tool (D) (Part No. II19254) - see Sketch 1.

#### If Caliper has a groove (see arrow A):

Pull in new Brass Bush (7) with Tool (D)

- see Sketch 2.

Remove Tool (D).

To prevent longitudinal displacement of the new Brass Bush (7) it must be grooved (see arrow B).

Before insertion of the Grooving Tool (F) (Part No. II36797), its hexagon screw must be wound out so that the head of the screw is approximately 20mm from the tool face. Insert the Grooving Tool (F) fully into the Brass Bush (7).

Wind in the hexagon screw of the Grooving Tool (F) to its stop.

Slacken the screw and rotate the Grooving Tool (F) in the Brass Bush (7) by approximately 60 degrees.

Again wind in the hexagon screw of the Grooving Tool (F) to its stop.

The new Brass Bush (7) is now firmly retained in the Caliper (see arrow B).

Before removing the Grooving Tool (F), its hexagon screw should be wound out approximately 20 mm.

#### If Caliper has no groove:

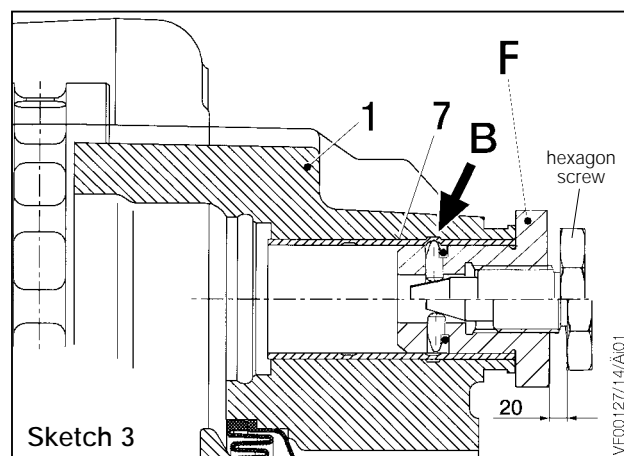
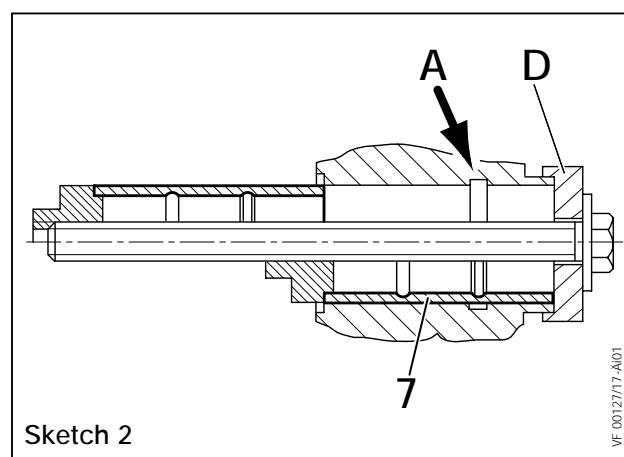
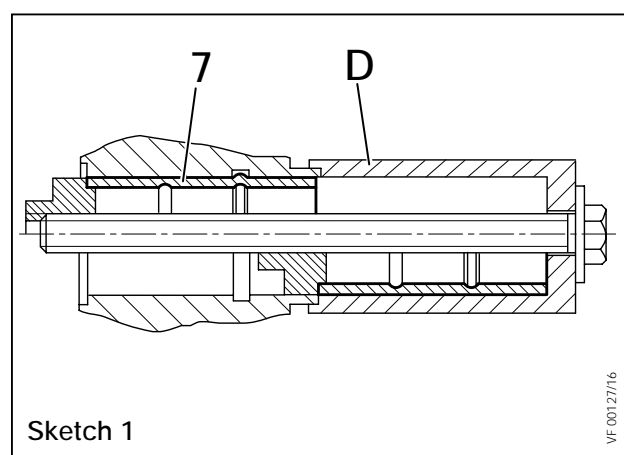
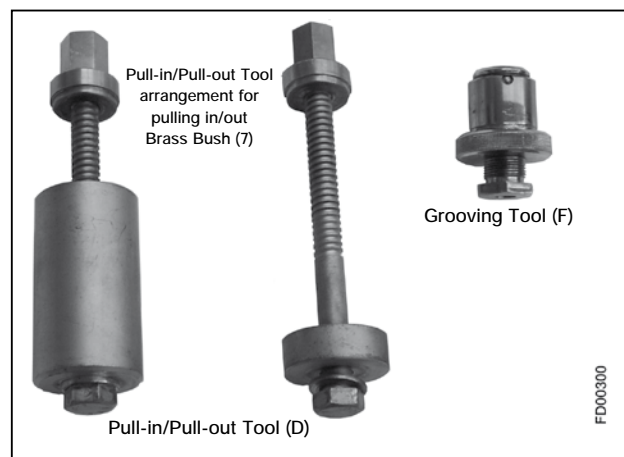
(Note: Groove is always located on the inboard side).

Pull in new Brass Bush (7) with Tool (D)

- see Sketch 2.

Check contact area of Brass Bush (7) for burrs and remove any burrs.

Grease Bush with **white** Grease (Part No. II14525 or II32868).



## 10.2 Rubber Bush (6a or 6b) Replacement

### Note:

A short or long version of the Rubber Bush (6a or 6b) is possible. The two versions are not interchangeable - see Sketch 4.

If necessary remove the Caliper (see Section 8.1).

Remove Guide Pin (4a or 4b).

Pull Rubber Bush (6a or 6b) out of bore.

Check bore for corrosion, clean and if necessary use a corrosion protection paint (e.g. Zinc spray).

### Note:

Grease new Rubber Bush (6a or 6b) inside and outside with **green** Grease (Part No. II32793 or Z000046).

### ATTENTION!

*Under no circumstances must the **white** Grease (containing mineral oil) be used for lubricating the Rubber Bush (6a or 6b) and Guide Pin (4a or 4b). Use only synthetic based **green** Grease (Part Number II32793 or Z000046).*

Deform new Rubber Bush (6a or 6b) and push from the inside of the Caliper into the bore.

Push Rubber Bush (6a or 6b) so that the external positioning ring(s) locate in the groove(s) (see arrows).

### ATTENTION!

*The Guide Pins (4 and 5) as well as the Caliper Bolts (39 and 40) are highly stressed items. They must be replaced whenever the Caliper (1) is removed from the Carrier (2).*

Assemble Guide Pin (4a or 4b).

Re-fit Caliper (see Section 8.2).

### Note:

Torque Caliper Bolts (39a) and (39b) to 180 Nm plus 90°. Check that the Caliper slides easily.

### ATTENTION!

*Screw threads and tapped holes must be clean and dry (free of lubrication).*

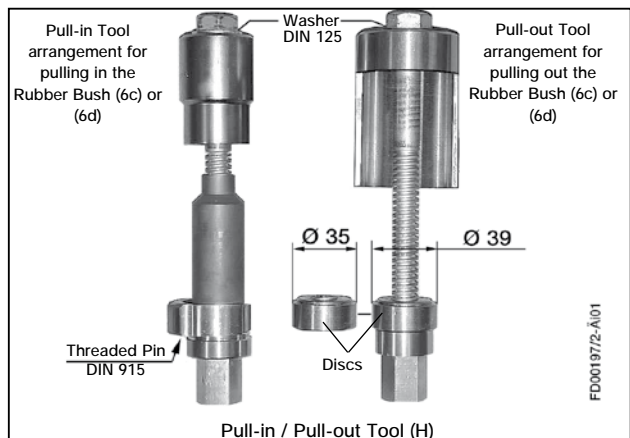
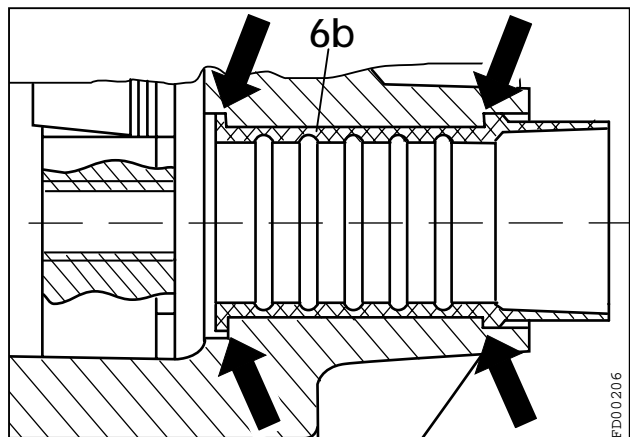
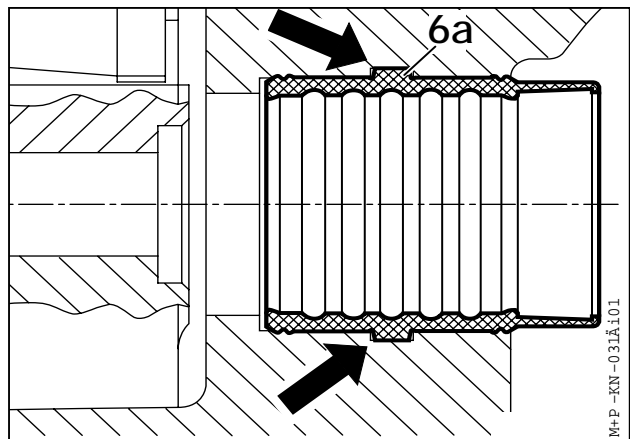
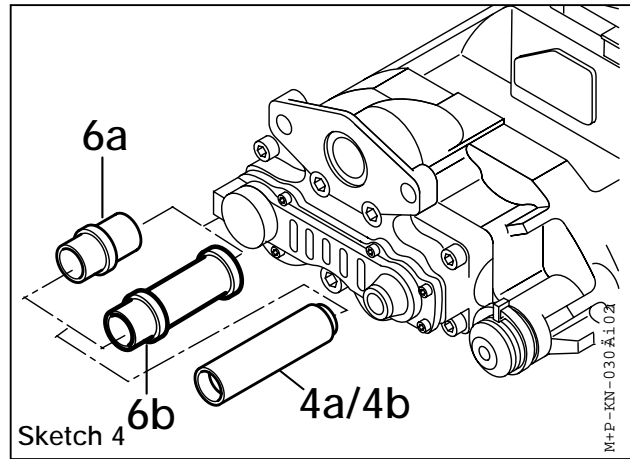
## 10.3 Rubber Bush (6c or 6d) Replacement

If necessary remove Caliper (see Section 8.1).

Use tool (H) (Part No. Z004198) for the assembly of the Rubber Bush (6c or 6d), (see adjacent picture).

### Note:

Depending upon shape of the Rubber Bush (6c or 6d) the appropriate disc must be selected, for pressing out (see also Section 10.3.2).



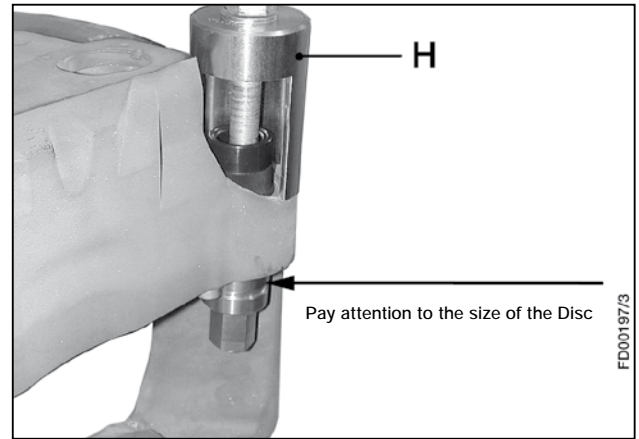
### 10.3.1 Removal of Rubber Bush (6c or 6d)

Remove Guide Pin (4c or 4d) .

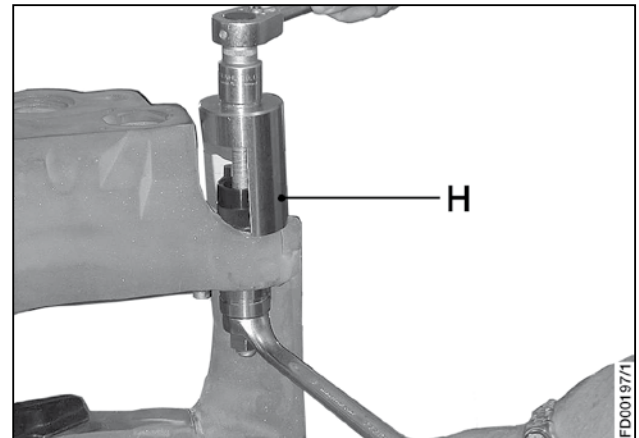
Clean Caliper in the area of the Rubber Bush.

Select appropriate disc for pressing out the Rubber Bush (6c or 6d). The disc locks into the Rubber Bush.

Position the Tool (H) (Part No. Z004198) as shown in the adjacent picture. Lightly screw on the nut by hand.



Hold the nut with a ring spanner and with a suitable socket or ring spanner tighten to remove the Rubber Bush.



### 10.3.2 Fitting of Rubber Bush (6c or 6d)

Check bore for corrosion and clean.

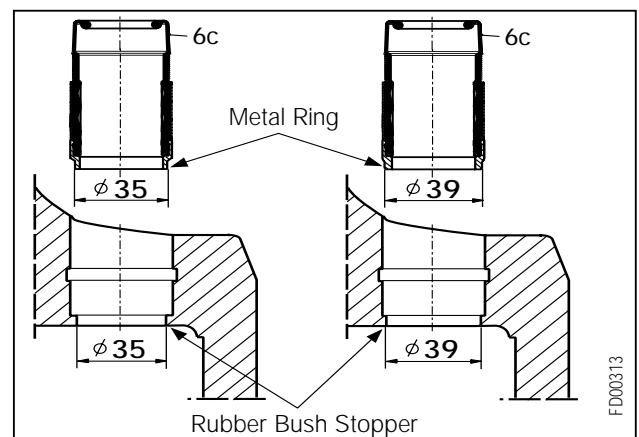
Rubber Bush (6c) is existing in two different versions.

Make sure, that the diameter ( $\phi$ ) of the Metal Ring is the same as the diameter ( $\phi$ ) of the Rubber Bush Stopper.

#### **ATTENTION!**

*If the wrong Rubber Bush (6c) is fitted, it can become loose, affect the Caliper Movement along the Guide Pins and reduce the braking force.*

Insert Metal Ring of the Rubber Bush (6c or 6d) into the caliper bore.



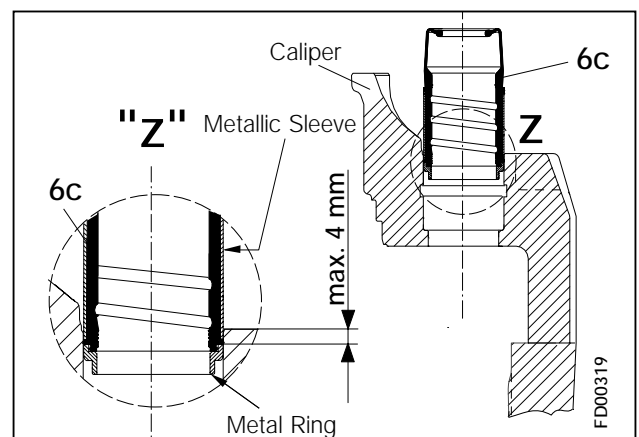
#### **ATTENTION!**

*The Metallic Sleeve of the Rubber Bush (6c or 6d) must not enter the caliper bore by more than 4 mm.  
If the Metallic Sleeve of the Rubber Bush (6c or 6d) enters the caliper bore by more than 4 mm then the caliper bore is worn and the Caliper must be replaced.*

Unscrew Threaded Pin in the Tool (H), so that there is no projection at the contact surface - see sketch 2 on page 46.

Push Rubber Bush (6c or 6d) into the Tool (H) - see sketch 1 on page 46.

Position Tool (H) with Rubber Bush (6c or 6d) as shown in adjacent picture - see sketch 1 on page 46.





Lightly screw on the nut by hand.

Screw in Threaded Pin until it contacts the Caliper in order to adjust possible unevenness at the contact surface - see sketch 2.

Using Torque Wrench pull in Rubber Bush (6c or 6d) (min. 8 Nm up to max. 45 Nm).

**Note:**

Do not tilt the Rubber Bush (6c) or (6d) when pulling-in.

Remove the Tool.

**ATTENTION!**

*If the torque is < 8 Nm or > 45 Nm, then the Caliper must be replaced. Failure to replace the Caliper could lead to a guidance failure.*

**ATTENTION!**

*The Metal Ring (see arrows in sketch 3) must not move. When checking for movement, then the Sealing Elements of the Rubber Bush (6c or 6d) must not be damaged.*

Grease the interior of the Rubber Bush (6c or 6d) with **white** Grease (Part No. II14525 or II32868).

**ATTENTION!**

*The Guide Pins (4 and 5) as well as the Caliper Bolts (39 and 40) are highly stressed items. They must be replaced whenever the Caliper (1) is removed from the Carrier (2).*

Push Guide Pin (4c or 4d) from the inside of the Caliper into the Rubber Bush (6c or 6d).

## 11 Carrier Replacement

(for Axial and Radial Disc Brakes)

**ATTENTION!**

*Before removing Caliper / Carrier bolts ensure that the Caliper / Carrier cannot move or fall when the bolts are removed causing damage or injury.*

If necessary remove Caliper (see Section 8.1).

Remove Carrier (2) from axle.

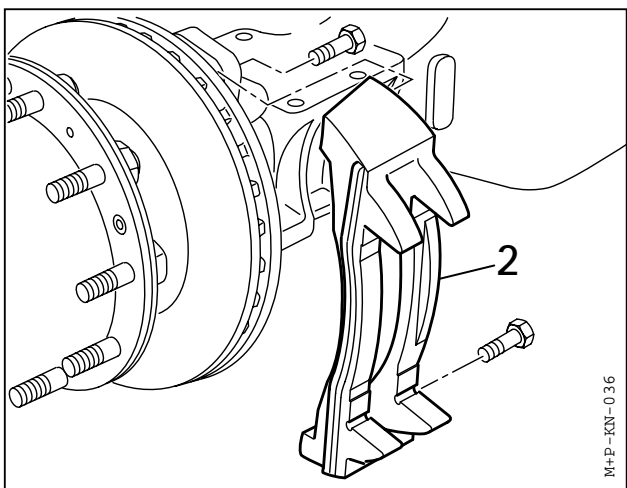
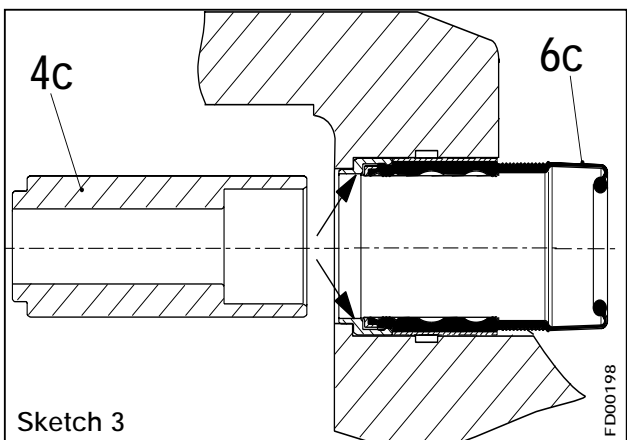
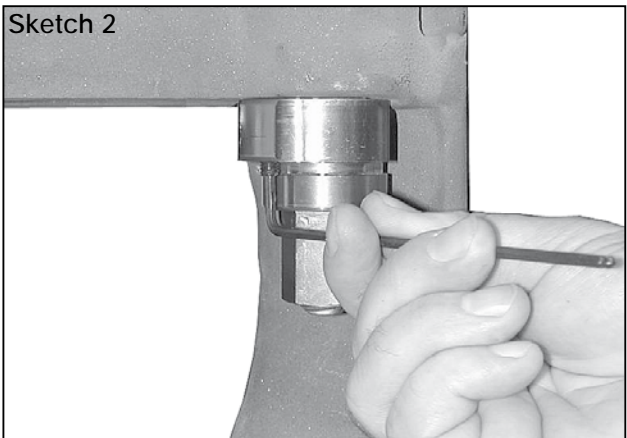
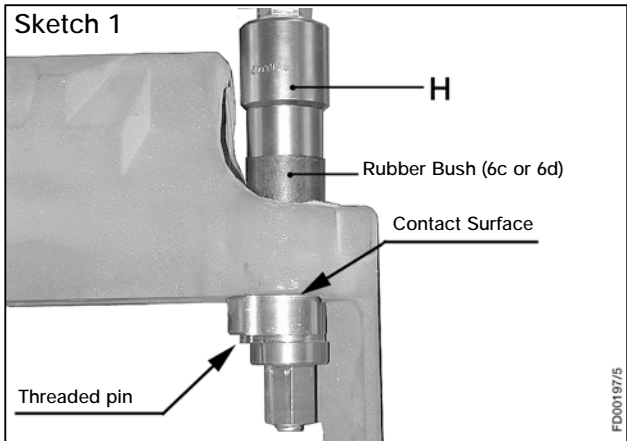
**Note:**

Do not fasten any lifting device to the Pad Retainer (11), since this can be damaged.

Clean axle contact area.

Fit new Carrier (2) with new bolts from the relevant Vehicle Manufacturer. Bolts are not supplied by Knorr-Bremse.

It may be necessary, to firstly attach the Caliper (see Section 8.2).



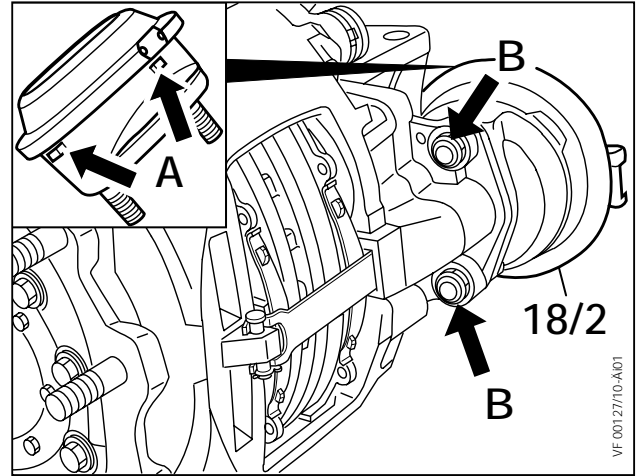
## 12 Brake Actuator Replacement (for Axial and Radial Disc Brakes)

### 12.1 Brake Chamber Removal

Disconnect air hose from Brake Chamber (18/2)

Unscrew Brake Chamber Mounting Nuts (see arrow B). They must not be re-used.

Remove Brake Chamber

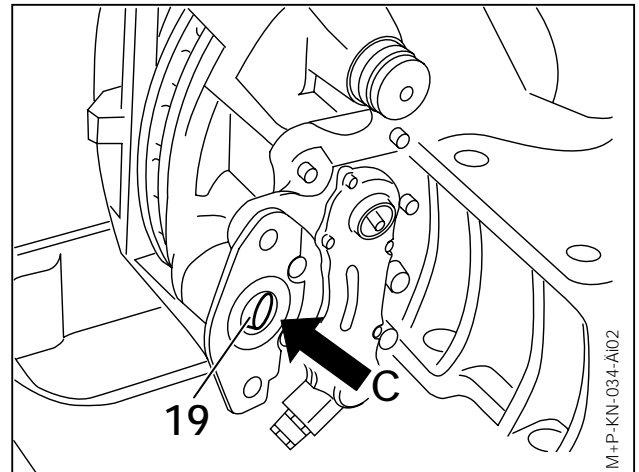


### 12.2 Brake Chamber Fitting

#### Note:

New Brake Chambers (18/2) have drain plugs installed (see arrows A). Remove lowest plug (as viewed when Brake Chamber is installed). All other drain holes should be plugged. Refer to the Vehicle Manufacturer's recommendations.

Before fitting the new Brake Chamber, the sealing surface (see arrow C) must be cleaned, and the Spherical Cup (19) in the Lever must be greased with **white** Grease (Part No. II14525 or II32868).



The surface area of the flange must be damage free and clean.

The Seal, as well as the piston area - see arrow in adjacent picture - must be clean and dry.

#### **ATTENTION!**

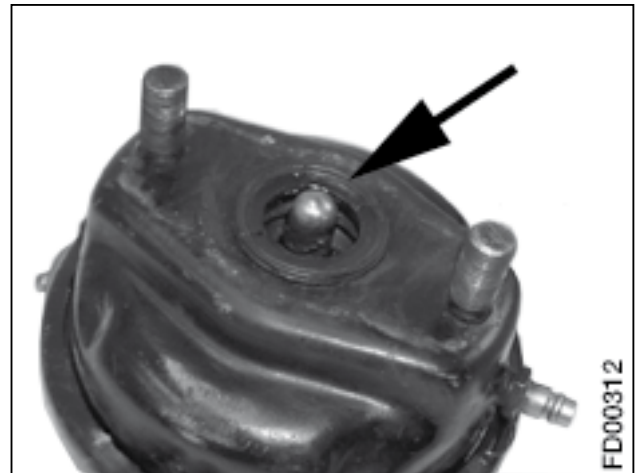
*Do not use Grease containing molybdenum disulphate. Use only Actuators which are recommended by the Vehicle Manufacturer.*

Attach Brake Chamber using new Nuts (self-locking EN ISO 10513).

In order not to tilt the Brake Chamber, screw Nuts step by step alternately with a suitable tool and torque tighten to  $180 \pm 30$  Nm.

Connect air hose and check for leakage.

Make sure that hose is not twisted and that chafing is not possible.



#### **ATTENTION!**

*Check function and effectiveness of the brake.*

### 12.3 Spring Brake Removal

#### **ATTENTION!**

*Chock wheels before releasing Spring Brake.*

Release parking brake, move Hand Control Valve to 'run' position.

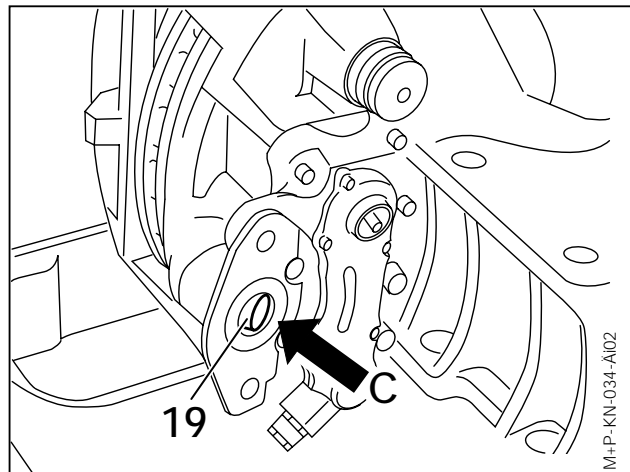
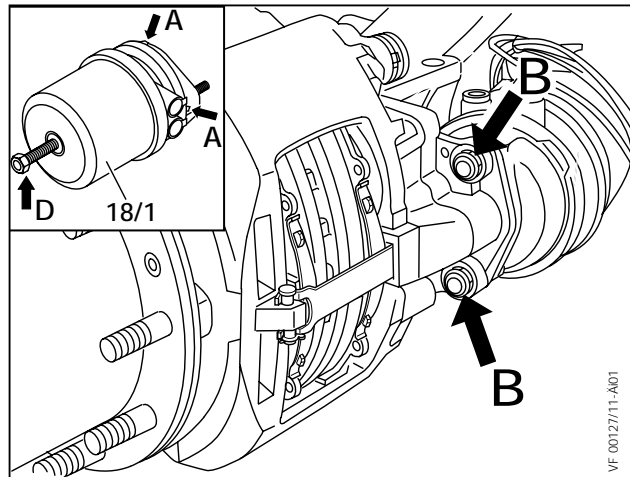
Screw-out Release Bolt (arrow D) with a maximum torque of 35 Nm (refer to the Vehicle Manufacturer's recommendations).

Release air from brake, move Hand Control Valve to 'park' position.

Disconnect air hoses from Spring Brake (18/1).

Unscrew Spring Brake Mounting Nuts (see arrow B). They must not be re-used.

Remove Spring Brake.



### 12.4 Spring Brake Fitting

#### **Note:**

New Spring Brakes (18/2) have drain plugs installed (see arrows A). Remove lowest plug (as viewed when Spring Brake is installed). All other drain holes should be plugged. Refer to the Vehicle Manufacturer's recommendations.

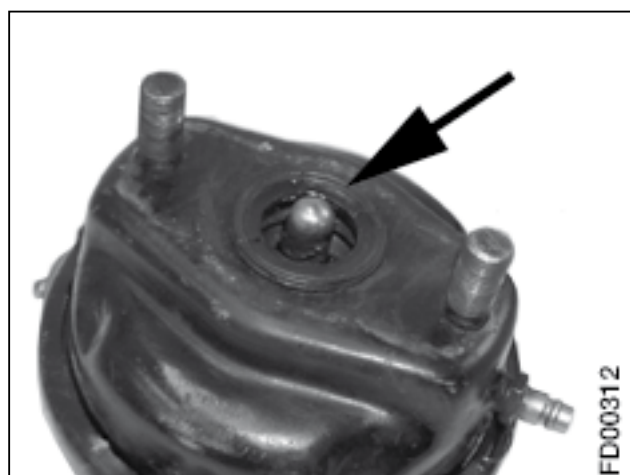
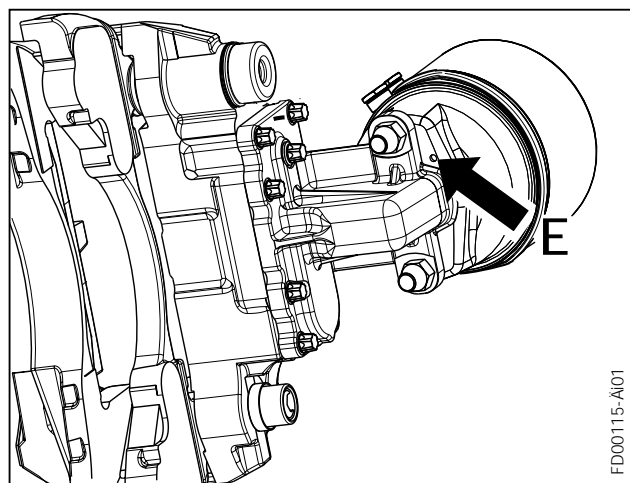
#### **ATTENTION!**

*On Radial Disc Brakes the drain holes in the Actuator mounting face must be open (see arrow E).*

Before fitting the new Spring Brake, the sealing surface (see arrow C) must be cleaned, and the Spherical Cup (19) in the Lever must be greased with **white** Grease (Part No. II14525 or II32868).

The surface area of the flange must be damage free and clean.

The Seal, as well as the piston area - see arrow in adjacent picture - must be clean and dry.



#### **ATTENTION!**

*Do not use grease containing molybdenum disulphate. Use only Actuators which are recommended by the Vehicle Manufacturer.*



Attach Spring Brake using new Nuts (self-locking EN ISO 10513). In order not to tilt the Spring Brake, screw Nuts step by step alternately with a suitable tool and torque tighten to  $180^{+30}$  Nm.

Connect air hoses, ensuring that they are replaced in the correct ports.

Make sure that hoses are not twisted and that chafing is not possible.

Release parking brake, move Hand Control Valve to 'run' position, and check for leakage.

Screw in Spring Brake Release bolt to maximum 70 Nm.

***ATTENTION!***

*Check function and effectiveness  
of the brake.*

**Notes:**



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